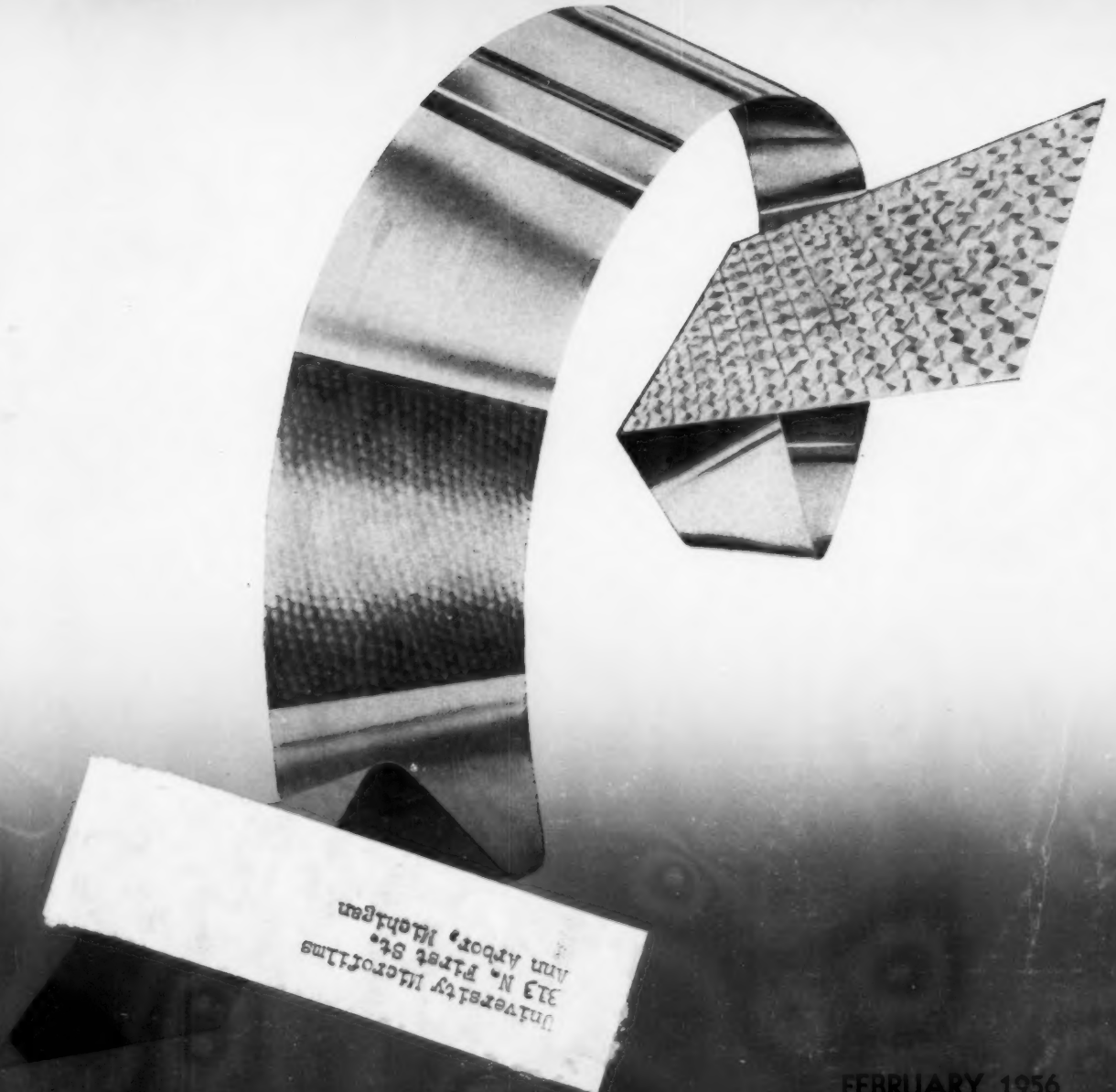
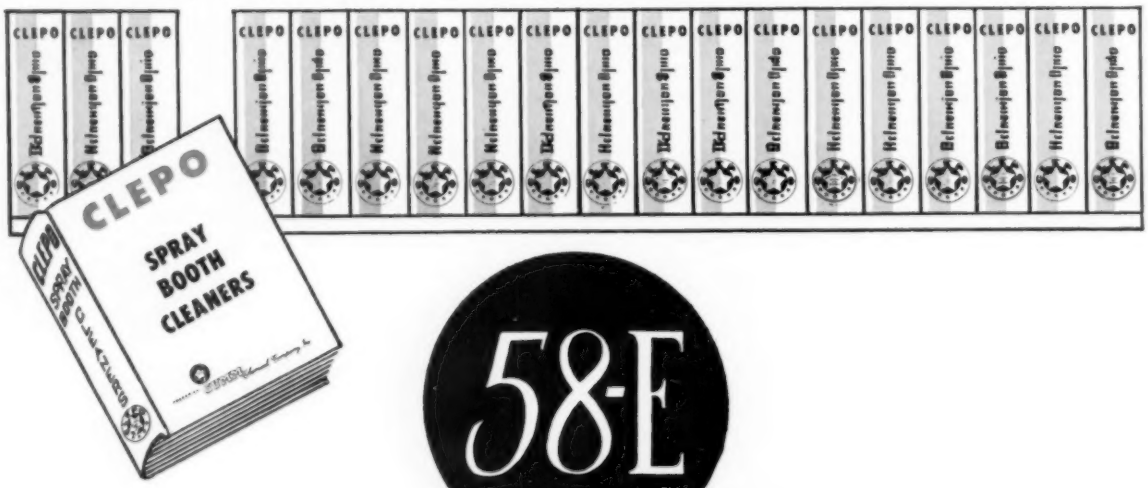
plating

JOURNAL OF THE AMERICAN ELECTROPLATERS' SOCIETY



FEBRUARY 1956

LIBRARY OF CLEPO SERVICE



58-E

57-T

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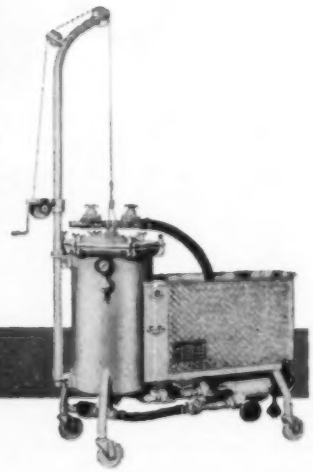
Ideal Toy Company is one of many Sel-Rex Filter users who enjoy the fruits of expert filter engineering know-how. If your manufacturing operation entails solids recovery or liquid clarification, it will pay you to investigate Sel-Rex Filters—the fastest cleaning filters on the market.

Sel-Rex Double Duty Filters use either a new stainless steel mesh element or POROUS STONE membrane. The entire element is secured to the tank cover—lifts out freely and easily for cleaning, by hand or with a hand-operated davit mounted on the shell on larger models. Messy handling of wet and dirty elements is eliminated—you can even clean an element used for carbon treatment without soiling your hands.



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An Educational Society for the Advancement of the Science of Electroplating, the Finishing of Metals and Allied Arts

plating

Journal of the American Electroplaters' Society

February 1956 **Vol. 43, No. 2**

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SOCIETY of BUSINESS MAGAZINE EDITORS

Editorial 171

Proposed "Substitutes for Nickel Plating." *Dr. A. Kenneth Graham* 218

Commercial Anodic Surface Treatments for Aluminum and Its Alloys *R. V. Vanden Berg* 221

Orsanco—The Determination of Nitrate-Nitrite Nitrogen. *E. J. Serfass, R. Muraca* 233

Plating—Art or Science? *A. H. Du Rose* 239

Removal of Fire Marks in Sterling Silver. *Dr. A. F. Mohnrheim* 244

AES Membership Report 261
AES News 260
Article References 250
Baltimore-Washington Convention 254
Books 213
Branch News 264
Classified Advertisements 286
Cover Story 208
Equipment and Supplies 194
Future Meetings 289
Industry News 172
Industry News Briefs 174
Index to Advertisers 288
Intersociety News 252
Mail Box 210
Meet Mr. President 262
Patent Abstracts 248
Personals 178
Professional Directory 286
Readers' Service Card 201
25 and 10 Years Ago 187
Trade Literature 188

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PLATING incorporates two major ingredients of a good modern trade magazine—editorial and advertising. Editorial serves the industry by reporting original research, new methods, theories, accomplishments, etc., while advertising contributes information of existing products, services and methods. These two ingredients are inseparable in our modern business structure, for each supports the other and both together serve the industry for which the publication exists.

Many theories have been advanced as to what weight each of these ingredients should be given. PLATING is proud to report that there never has been a policy of loading the magazine with advertisements, skimping on editorial treatment and cutting corners to yield a larger profit, a practice which has enabled many publishers to grow rich. Instead, PLATING, with an increased income from advertising, has been able to increase its services and to ever-improve its editorial material.

We congratulate the advertisers who have taken advantage of PLATING's growth and concentrated market coverage. Through them, PLATING has found it possible to render better service to the advertisers and the industry.

P. Peter Kovatis

P. PETER KOVATIS
Executive Secretary

INDUSTRY NEWS

Record Year for Sylvania—Sales of Sylvania Electric Products Inc. in 1955 exceeded $300,000,000 for the first time in the company's 54-year history, according to Don G. Mitchell, chairman and president. Sylvania's best previous year was in 1953 when net sales totaled $293,267,000. In 1954, the total was $281,642,000.

In a year-end statement, Mitchell said 1955 was "the most successful year that Sylvania ever has had, not only from the point of view of sales, but also because of the company's achievements in the scientific and engineering fields; continued expansion in plants and equipment; the development of new and improved products and production techniques, and continued strong competitive positions in all product lines."

Two New Reps for Simpson—The Simpson Electric Company of Chicago, Ill. is proud to announce that E. A. Dickinson & Associates, Milwaukee, Wisconsin have joined Simpson to act in the capacity of representatives covering the territory of the State of Wisconsin except for the portion west of Alma, Wis. on a straight line north to Superior.

Of the two principals Edward A. Dickinson has previously been engaged in engineering and sales with Cutler-Hammer, Inc. in Milwaukee. He is a registered professional engineer of that state. He has been actively engaged as a manufacturer's rep. since 1947. John N. Dickinson also a professional engineer joined the association in 1951.

Accomplishments—Givilym A. Price, chairman and president of Westinghouse Corp., in a year-end statement, pointed to the Company's accomplishments. The strike at Westinghouse plants, which began on October 17, has had a disruptive effect on the Company's operations for the year. It has overshadowed a great many significant developments and achievements in all divisions of Westinghouse during 1955.

During the year, Westinghouse research scientists made a number of valuable contributions to fundamental scientific knowledge. These include: (1) The discovery of a new property of metals at very low temperatures which sheds new light on the unique flow of electric current in these materials; (2) the attainment of vacuums so perfect they approach the emptiness of outer space; (3) further insight into the "secrets" of the behavior and preparation of metals and alloys; and (4) greatly improved understanding of such phenomena as electroluminescence, semiconductors, and the atomic structure of metals.

As this fund of basic knowledge was increased, other scientific contributions of the past reached fruition during 1955 in a long list of technical advances by the Company. Achievements were recorded in new and improved products, new engineering developments, and new manufacturing techniques.

Typical of these developments are:

A new high-temperature insulating enamel for copper wire;

New and improved methods for refining titanium and other hard-to-get metals;

A new, large-screen color television tube;

A transistorized torpedo control for the U. S. Navy;

Propulsion equipment for the nation's first super-aircraft carrier, the *Forrestal*"

A revolutionary x-ray movie unit;

Development of improved magnetic materials;

Introduction of large power rectifiers made of silicon;

A new method of water sterilization using ultra-violet lamps.

Anniversary Party—Davies Supply and Manufacturing Company, St. Louis, Mo., celebrated its 10th anniversary with a party at the company offices. Davies is the southwest distributor of all the various products used in the metal finishing field. In addition, they manufacture a complete line of plating racks and apply a protective plastisol coating called Davynol. The latter two products are sold nationally.

Approximately 500 invitations were sent out for the Company's 10th anniversary with practically everyone attending. Arrangements for the affair were handled by L. A. Davies, president, and E. L. Conroy, vice president.

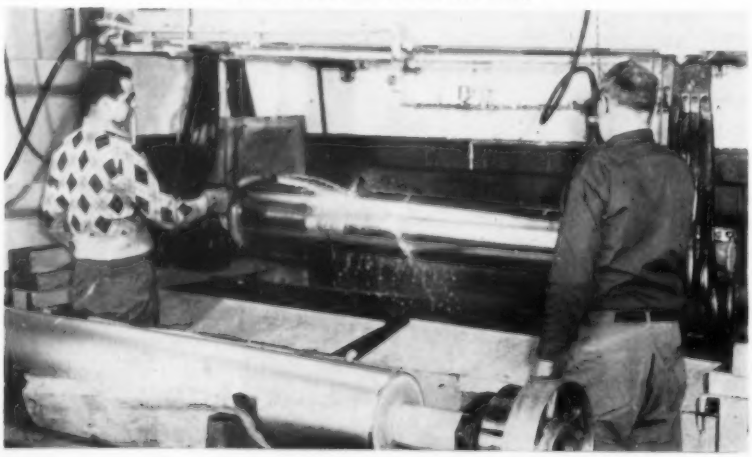
Gravure Cylinders Get a Pre-plating Rinse—Gravure printing cylinders are given a warm water rinse prior to chromium plating in a specially designed, horizontal, 600-gal electroplating tank at Art Color Printing Co., Dunellen, N. J.

The cylinder is held on a work carrier yoke over the plating tank, which was designed and built by Hanson-Van Winkle-Munning Co., Matawan, N. J. After the cylinder is rinsed, the yoke lowers it into the tank, where it is completely immersed for one hour. During this period the cylinder is continuously rocked 90 degrees to the right and left. The rocking assures a uniform chrome deposit.

Plating bath is maintained at 113°F by vertical loop-type heating and cooling coils. Immersed in the bath are Chrome-Flo lead anodes, spaced three per foot. Plating current, passing through flexible plastic-insulated contacts, ranges from 2300 to 3400 amps, depending on the size of cylinder being plated. A thickness of about 0.00025 in of chromium is deposited in the process.

The complete plating operation includes cleaning, acid copper plating, polishing, etching and chrome plating. After cylinders have been used on a press run, they are stripped of their coated and etched surfaces and replated.

Warm Water Rinse Before Cr. Plating



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5 They can depend on MICCROSOL to keep their reputations, and the quality of their work, at the highest level in the industry.
6 They have helped us develop MICCROSOL to its present point of perfection.
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8 MICCROSOL responds to their skill and experience. Helps them give you the rugged coatings you need to protect work and your equipment.
9 MICCROSOL coatings last longer.
10 They can depend on MICCROSOL!

You can't blame us for being proud of the quality of the coating work produced by our customers. We have worked with them, and for them, to the very best of our ability, during the phenomenal growth of the coating industry. We know them well, and appreciate their loyalty and support. And we hope to have the privilege of serving them all for many years to come.

There's a MICCROSOL Coater located in your vicinity. He's undoubtedly the leader in his field. If you want superior coating jobs, we'll be glad to help you get in touch with him!

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Nickel Plating Troubles

●

Trouble shooting in barrel nickel plating is just about the same as for any nickel plating. The troubles are usually aggravated by the extreme range of current densities over which barrel plating is done.

●

The troubles encountered in barrel nickel plating can be centered in two general groups which are most common.

●

Peeling and flaking of the nickel plating usually nickel from nickel and best shown by bending the pieces or by rubbing a quantity of them between the production of flakes of nickel is a very common trouble. Often it will show up on one part plated in a barrel and not on other parts.

●

This trouble assuming you are using a stable brightener is usually caused by a flash burning condition which is covered over with a poorly adherent subsequent nickel plate. The cures are to check the nickel solution and be sure that the nickel content and boric acid content are high enough. Boric acid content is especially important. On parts which do not tumble easily loads must not be too large or too small as poor tumbling or poor contacts may result. Speed of rotation of the barrel should be as high as practical usually in the range of 5 to 10 rpm. Temperature should be as high as practical to reduce flaking, also considering that high temperatures may produce dark recesses.

●

Contamination of barrel nickel solutions is a second source of much trouble. Slight contamination is indicated by dark recesses and very bad contamination may cause general gray plate. Usual contamination is copper which may be accompanied by zinc. The cure is simple but time consuming. Dummy plating at about ¾ volt removes the copper without wasting precious nickel. Special addition agents will sometimes carry a solution for a few days until dummy plating is convenient. *p*H should be watched. Low *p*H will cause poor recesses even in a comparatively pure solution. A common cause of copper contamination is nickel chloride. This may be avoided by using magnesium chloride which is available in a very pure form at low prices.

●

All this information and more is available in our technical bulletin on barrel nickel plating. A copy is yours for the asking.

TRUE BRITE CHEMICAL PRODUCTS CO.
100 FALLS AVE. OAKVILLE, CONN.

INDUSTRY NEWS BRIEFS

● Reflecting industry's increased demand for trained instrument personnel, **The Foxboro Company,** Foxboro, Mass., is doubling the size of its Training and Education Center. Scheduled for completion early in 1956, the new building will accommodate 46 trainees, nearly twice the number handled previously.

● Appointment of **W. J. Savage Company,** Knoxville, as a distributor in Eastern Tennessee for Lay-Set wire rope, product of the Hazard Wire Rope Division of American Chain & Cable Company, Inc., Bridgeport, Conn., has been announced by Emerson H. Todd, sales manager.

● For the first time in history, a silverclad steel plaque was placed on a railroad tank car to commemorate the 25th anniversary of the production of clad steels. The ceremony, marked by **Lukens Steel Company** of Coatesville, Pa., which first produced clad steel plate for commercial purposes in 1930, coincided with the opening of the silver anniversary of the Exposition of Chemical Industries at Philadelphia's Convention Hall. Honored was tank car CCNX-1, owned by the Catalin Corporation of America and built of the first clad steel plate ever rolled.

● **Bogue Electric** of Canada, Ltd., has formally opened new production and administrative headquarters in a modern plant recently completed at Gloucester, near Ottawa, Ontario.

● **Bell & Gossett Company** has recently announced the appointment of the Squire-Cogswell Company as representatives in the Chicago area for its new line of oil-less air compressors and paint spray outfits.

● A tentative agreement for merger of **Sabre Uranium Corporation** and **Pinon Uranium Company** has been reached, according to a joint announcement made by the managements of the two companies.

● The largest use of ion exchange materials outside of the field of water treatment is in the recovery or extraction of uranium ores from acid leach solutions. Henry W. Foulds, president, The Permutit Company, said this in connection with the starting of capacity production at **Gunnar Mines, Ltd.** at Uranium City, Saskatchewan, Canada.

● A fund of more than $900,000 for grants to over 100 universities and colleges in its annual program of aid to education has been announced by the **Du Pont Company.** This support, which is for the next academic year, is a substantial increase over the $800,000 in gifts made for 1955.

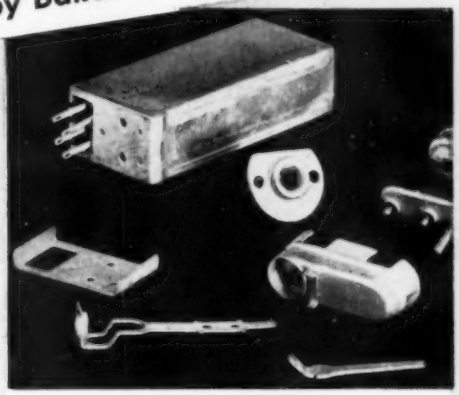
● A 30 per cent increase in sales for the investment casting industry in 1956 is forecast by Vincent S. Lazzara, president of the **Investment Casting Institute,** Chicago, and president of **Casting Engineers, Inc.,** also of that city.

● **Kaiser Aluminum & Chemical Corporation** has announced a new $280,000,000 expansion program that will bring the company's total primary aluminum capacity up to 654,000 tons (1,308,000,000 pounds) per year. This expansion will increase Kaiser Aluminum's basic capacity by more than 50 per cent.

Improved Plating Techniques by Baker & Adamson

Vital Engine Parts Protected!

A harder coating, with better corrosion and wear resistance, is produced with a low tin-content B&A fluoborate bath for protecting bearings and other engine parts. Additional uses include depositing coatings on pistons and similar parts to provide marginal lubrication during break-in periods, electro-cladding wire and plating threaded parts for needed lubrication properties.



Soldering Made Easy!

A high-tin-content fluoborate bath produces coatings of excellent solderability on electronic or electrical parts where the use of a non-corrosive flux is desired. It also gives a uniform coating that expedites assembly, and where the parts can be fused, the B&A Fluoborate alloy bath can be used to deposit the solder, eliminating costly hand soldering.

NOW...You Can Plate CUSTOM-MADE Alloy Coatings with B&A Lead and Tin Fluoborates!

These are high-speed, low-cost operations . . . short-cuts to producing better, more economical products.

The plated coatings shown are actually tailor-made to specific requirements with Baker & Adamson Lead and Tin Fluoborate Solutions. When protective and lubricating coatings are required, as in bearings, lead-tin alloys of low tin content are readily plated. Where a deposit of good solderability is desired, as in electronic parts, alloys with 40-60% tin content can be produced. B&A Lead and Tin Fluoborate Solutions, combined in a bath using alloy anodes, produce dense, fine-grained, uniform deposits with pre-determined characteristics. Send the coupon for detailed technical bulletins.

B&A Fluoborate Plating Chemicals Include:

Lead • Tin • Iron • Copper • Nickel • Cadmium
Indium • Antimony* • Chromium* • Cobalt*
Fluoboric Acid

*Experimental quantities only

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☐ Your Technical Bulletins No. TC38351, RA38351, and RB38351 on applications and techniques for plating lead and tin alloy coatings.

☐ Information on applications of other B&A Metal Fluoborates. Specify type _____

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Company _____

City _____ Zone _____ State _____

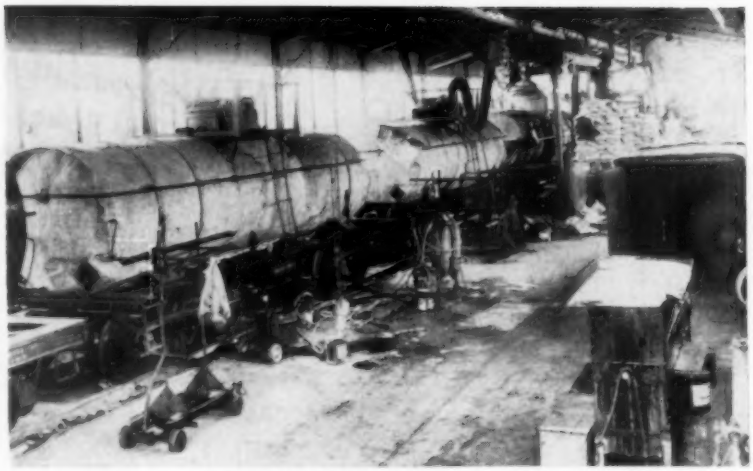
PL-2

INDUSTRY NEWS

New Director—William H. Evans, a vice-president of Diamond Alkali Company, Cleveland, Ohio was elected to the Board of Directors at a board meeting held at the Company's national headquarters here late today. His election fills a vacancy.

During his 18 years' service, Evans has held a number of key executive posts, including that of treasurer.

For six years prior to his promotion to vice presidency in June, 1954, Evans had been manager of the Company's nationwide sodium silicate operations, which encompass six plants producing basic silicates and specialized derivative chemical products.



Big Facilities For Big Jobs

Big New Equipment for Big Jobs—The MW Protective Coatings Division of Metalweld, Inc., announces that all of the facilities connected with its new Scotts Lane Plant have now been completed so that the company is ready to return to normal schedules on all phases of protective coatings service including the application of rail tank car and tank truck linings and coatings as well as work on ship and barge tanks, storage tanks, process and similar equipment exposed to critical corrosion-contamination conditions. Up to now, heavy summer and fall schedules have prevented the completion of several key facilities.

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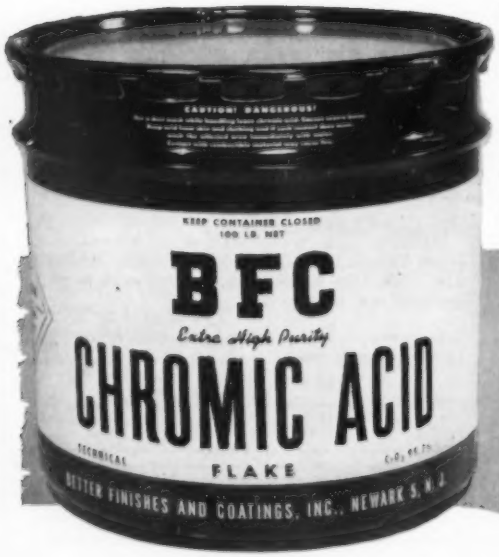
Prompt Friendly Service



What more could anyone ask for?

Chances are you'll be very happy doing business with us. Next time you're in the market why not send us a modest order just to find out how good BFC Chromic Acid really is.

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2014 East 15th Street, Los Angeles 21, Calif.

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Six more progressive firms have joined the AES Research effort through the important medium of the Sustaining Membership program. The new firms are:

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Advance Plating Co., Inc., Subsidiary Aluminum Ind., Inc. Detroit, Michigan	Detroit
Metal Plating Corp. Oak Park, Michigan	Detroit
Metal & Thermit Corp. New York, New York	New York
Republic Steel Corp. Cleveland, Ohio	Cleveland
Smoothex, Inc. Cleveland, Ohio	Cleveland
Steel Heddle Mfg. Co. Philadelphia, Pa.	Philadelphia

Number of Sustaining Members supporting AES Research through this month 332

Number of Sustaining Members through last month 325

Economy Through Quality Stressed at Oakite Conference—The savings effected in industrial production through the use of quality cleaning materials were stressed in the annual technical conference held by Oakite Products, Inc., in New York City, November 17 through 19.

One of the features of the conference was a discussion of 18 new cleaning, sanitizing, and metal treating materials; improvements in the Oakite CrysCoat Process of phosphating; and improved mechanized cleaning methods developed during the past two years.

Nankervis Opens Flint Sales Office—The George L. Nankervis Company of Detroit has announced the opening of a Flint sales office for the convenience of its Flint, Bay City and Saginaw area customers.

Nankervis

In addition to its manufacturing operations, Nankervis handles a full line of metal finishing equipment and supplies.

The office staff will be under the direction of Cecil P. Nankervis. A resident of Flint for many years, Nankervis is a former president of the Flint Industrial Executive Club and is active in city civic affairs. Offices will be located at 1204 Metropolitan Building.

Process for Chrome Plating Titanium—A development of Tiarco Corporation, Clark, N. H., the Baylig process permits chromium to be applied directly to titanium. The company claims that there is no chipping or peeling even under the most severe tests. Tiarco developed the Baylig process a couple of years ago. After a year of testing with a small group of industrial concerns, they are now releasing it generally.

Tiarco has also developed a process for plating aluminum and steel directly with chromium.

Now... the desirable physical characteristics of rhodium at lowest cost!

Sel-Rex

Bright Rhodium PROCESS

Rhodium plating for industrial applications is now an economical process, thanks to another great advance in plating technique by the creators of Sel-Rex Bright Gold.

Sel-Rex Bright Rhodium meets the need of industry for a simple, stable process to produce high quality results under a wide range of plating conditions. It produces the most desirable characteristics of rhodium — hardness (775-820 Vickers, electroplated), a brilliant highly reflective surface which resists corrosion and will not tarnish under any atmospheric conditions.

The Sel-Rex Bright Rhodium concentrate, is refined by a special process which assures *consistent* high purity and best possible electroplating results.

Sel-Rex Bright Rhodium actually plates bright longer than other rhodium processes.

This has been proved in our own laboratories and in numerous commercial plating installations throughout the country. You get excellent conductivity and reflectivity whether the thickness is less than ½ or greater than 10 one-millionths of an inch. Heavier deposits produce a bright hard surface that is desirable for sliding or wiping electrical contacts where light or heavy pressures and low contact resistance are required.

See for yourself why Sel-Rex Bright Rhodium has been 'written up' in the original job specifications of prominent commercial organizations and government agencies. Send for free literature covering technical data and applications.

Sel-Rex Precious Metals, Inc.

Dept. PL 2—229 Main Street, Belleville 9, N. J.

Newark Detroit

Manufacturers of Sel-Rex Bright Gold and Sel-Rex Silver Sol-U-Salt

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 208.

PERSONALS

Duncan Gent MacQueen Wilson

F. S. Mulock, president of the American Zinc Institute Inc., has announced that **Ernest V. Gent** has retired from office. **John L. Kimberley** has been appointed executive vice-president in his stead.

Beverly W. Duncan has been appointed head of research and development for Misco Precision Casting Company, Whitehall, Mich.

Duncan is a member of the ASM, the American Foundryman's Society, the AES, and the Society For Non-destructive Testing.

Chester L. McCormick, of Millburn, N. J., has been named to supervise sales in Mass., R. I., Conn., N. Y., N. J., Del., and Md. for Flex-O-Tube Div., Meridan Corp., Mich.

The appointment of **William Howard Leggett** as sales engineer has been announced by Acheson Colloids Company, Port Huron, Mich.

Leggett will head the Rochester, N. Y., sales office of the company, covering upstate New York replacing **Edwin A. Lampman** who retired in January 1956.

Leggett Kimberley McCormick Holzwarth

Raymond Day has joined the sales department of Canadian Hanson & Van Winkle Company in Toronto. He will operate from Head Office and will service the central portion of Metropolitan Toronto. For the past eight years Day has been in the laboratory of the John Inglis Company and for the past five years has been laboratory supervisor responsible for electroplating, phosphating, paint and ceramic controls and practices. Day is 2nd vice-president of the Toronto branch of the AES and a member of several other technical groups.

International Business Machines Corp. announces the appointment of **J. Donald MacQueen** as associate staff engineer in the metallurgical laboratory.

He is a member of the IBM Country Club, IBM Study Club, Vestal Kiwanis, ASTM, ASM and AES.

Joseph C. Holzwarth, Jr., has been appointed advertising manager of the Simplex Valve & Meter Co., Lancaster, Pa.

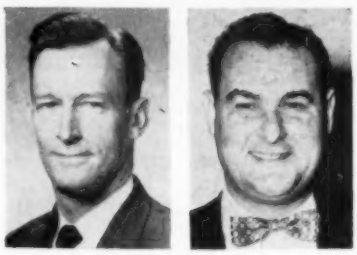
The appointment of **Lee Wilson** as manager of Air Compressor Division was announced by Bell & Gossett Company, Morton Grove, Ill.

Day Gilbert

Herbert Brown and **Richard S. Keen** have joined the service staff of Wyandotte Chemicals Corp.

Brown is a member of the New York Branch of the AES. He has had sales-service experience since 1951 contacting the metal finishing industry in eastern United States.

Keen has attended both Wayne University and Henry Ford Community College. He has been connected with the laboratory testing of plated coatings for Ford Motor for a number of years.



Keen Brown

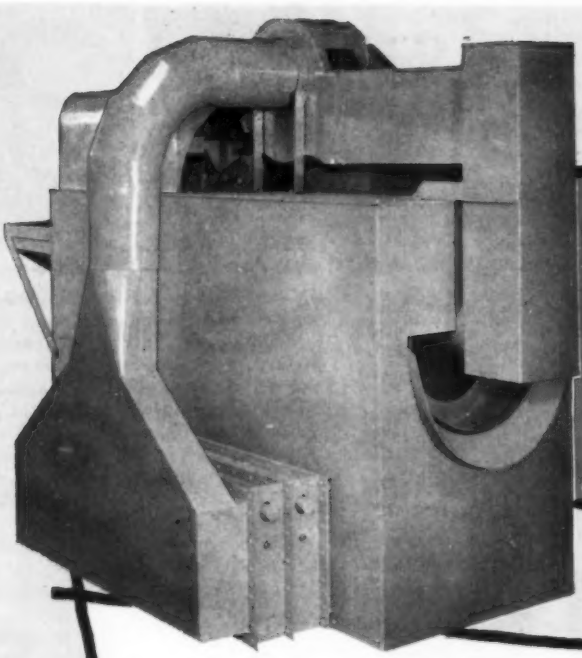
Morton B. Gilbert has joined the Chicago district staff of F. J. Stokes Machine Company as a sales engineer.

Born in Lynn, Mass., and educated in the public schools of Haverhill, Gilbert was graduated from the U. of Mass. in 1949 with a BS in chemistry. For the next year he did graduate work at Kansas University, where he held a teaching fellowship.

Whitfield Chemical Company, Detroit manufacturers of industrial metal cleaning and finishing chemicals, announces the appointment of **James E. Dugan** as sales engineer covering parts of Mich., Ohio, and Ind. Dugan was formerly associated with General Motors and with Chrysler Corporation.

Charles H. Seibert, credit manager of Behr-Manning, Div. of Norton Co., has been elected president of Credit Group E of the Motor Equipment Manufacturers' Association. Seibert served last year as vice-president of Group E, which includes the eastern states. He is also vice-chairman of the association's executive credit department committee.

Seibert Dugan



Bone Dry.. Up To 900 Quarts Of Parts Per Hour ...Automatically!

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*Can be arranged for any height from tote pan to 55-gal. drum.

- Virtually eliminates *all* drying labor.
- Hot blasts parts completely dry over a 3-speed spiral—automatically—regardless of design, recesses or contours in the work.
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- Replaces up to 3 sawdust tumblers plus 2 or 3 centrifugal dryers.
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PERSONALS

Dr. John T. Burwell, Jr. has been named vice-president of Horizons Inc., Cleveland industrial and governmental research organization.

Awarded his doctorate in physics at MIT, Dr. Burwell first served as a research physicist for the United States Steel Corporation before returning to MIT as Associate Professor of Mechanical Engineering and Director of the Lubrication Laboratory.

Dr. Burwell is a Fellow, American Physical Society; member, Society of Sigma Xi; former member, NACA Subcommittee of Lubrication of Wear; former member, ASME Special Research Committee on Lubrication. He has published more than 30 papers in various fields of his specialties, including several on general surface and crystal structure. He edited the book, "Mechanical Wear" (ASM) and has applied for patents on extractive metallurgy of transition metals and on bearing materials.

The addition of **Josef F. Palme, Jr.** to the sales engineering staff of Bart Laboratories Co., Inc., Belleville, N. J., marks another step in the continued expansion of this pioneer precious metals plating organization.

Palme, who holds the degree of MS in chemical engineering from Newark College of Engineering, has been employed as sales engineer, project and development engineer with such companies as Fluid Controls Co., N. Y. C.; Reichold Chemicals, Inc., Elizabeth, N. J., and Essex Rubber Company, Trenton, N. J.

Azzolina

Couch

Edward R. Couch has been appointed manager of stationary compressor sales.

Couch's new duties include planning stationary compressor sales, assisting in promoting a strong distributor sales and service program, and assisting field personnel on special applications. Prior to joining Le Roi in 1954 as an assistant product sales manager, Couch was with the Industrial Products Division of Westinghouse Air Brake Co.

Paul Azzolina has been named manager of the service department for the Le Roi Division, Westinghouse Air Brake Co.

As manager of the service department, Azzolina will be responsible for supervising field servicing of all Le Roi products, maintaining the parts department, and publication of service bulletins and parts catalogs.

Metal & Thermit Corporation has announced that **C. J. Beasley,** formerly controller and assistant secretary, has been appointed a vice-president and will plan and direct the financial activities of the company.

Hervey

Beasley

C. R. Hervey, formerly assistant controller, has been appointed controller, succeeding **Beasley** in this capacity. Beasley will retain the title of assistant secretary.

Beasley is a member of the Capital Assets Committee of the Controllers Institute. He is a graduate of the University of Notre Dame.

Hervey joined Metal & Thermit as assistant to the controller in 1951, and was appointed assistant controller in 1952. He was formerly connected with O. M. Scott & Sons Co. and with Lybrand, Ross Bros. & Montgomery.

Hervey is a member of the Controllers Institute, the New York State Society of Public Accountants and the American Institute of Accountants. He was graduated from Ohio State University.

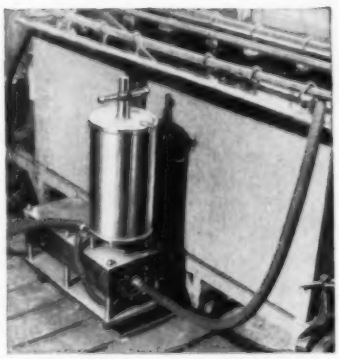
LOOK

No Rejects

NO pitting, spotting, or reworking . . . . . .

Impurities—primary cause of pitting, spotting, rejected finished work—are positively eliminated by the Alsop "Sealed-Disc" Filter. That's because they're designed for Platers—to meet plating room requirements. That's why they're compact, portable—smaller than conventional filters—save valuable space—yet capable of handling equal volumes of solutions.

Simplicity of design cuts operating time and labor—means savings for you. Check its many additional proved performance features and know why more platers depend on "Sealed-Disc" Filters. Ask your regular plating supplier—or write for details.



"Sealed-Disc" Filters remove more impurities with less effort and in less time. Use it on your acid dips, electro cleaners, and solvents too.

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Positive Filtration

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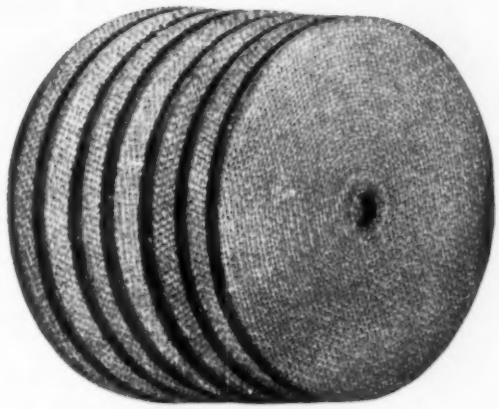
REMOTE CONTROL AT SMALL EXTRA COST

For that tough cutting down job on steel or stainless steel, solve your problem with

RELIANCE SISAL BUFFS



Specially treated:

For cooler operation—

For longer life by binding the fibres together to prevent fraying—

For better compound adherence—

To cut faster and bring up a high finish

RELIANCE matching compositions furnished in either molded cakes, or extruded to your specifications.

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PERSONALS

Joseph Horacek, Jr. has been appointed assistant sales manager of Turco Products, Inc. In addition to general overall sales responsibilities, Horacek will specialize in sales personnel, sales training and new product development.

A graduate chemist, Horacek was graduated from Emory University in Atlanta, Ga., in 1934. He is a member of the AES and the American Society of Lubrication Engineers.

Horacek, Jr.

Bellinger

Kenneth P. Bellinger has recently resigned as executive vice-president of the Chemical Corporation, Springfield, Mass., to form his own company, Conversion Chemical Corporation, Rockville, Conn. The new organization will specialize in specialty cleaners and treatments for the metal finishing industry. The company will also represent a number of well-known manufacturers in the metal finishing equipment field.

George R. Galbraith has been appointed assistant vice-president of the Walworth Company.

Galbraith will be in charge of coordinating Walworth sales development work by industries and products. In addition to his new duties, he will continue to have charge of Walworth Marine Sales and Specialty Products.

The appointment of **Joseph G. Cannon** as field sales manager for the Tungsten and Chemical Division of Sylvania Electric Products Inc. has been announced. Cannon will be located at division headquarters in Towanda.

Previous to his new appointment, Cannon was district sales supervisor for the Tungsten and Chemical Division and was located in the company's sales offices at Union City, N. J. He served in this capacity from 1952 to 1955. Cannon joined the division in 1947 as a sales engineer and in 1950 was transferred to the district sales office covering Northern Atlantic States. He was graduated from Pennsylvania State University with a BS degree in chemical engineering in 1944.

Also announced were the appointments of **Charles H. Carpenter, Jr.,** as assistant manager, Market Development Department, and **Joseph P. Davis** as personnel assistant. Both will be located at the company's home offices in New York.

Carpenter, a chemical engineer, comes to Metal & Thermit from American Cyanamid Co. where he served as Senior Market Analyst. Prior to that he held positions as chemical engineer, development engineer and group leader, research, at United States Steel.

Davis

Carpenter Jr.

Joseph P. Davis, new personnel assistant for M & T, was formerly staff relations assistant at Irving Trust Company and prior to that was assistant to the president and assistant director of admissions at Upsala College.

Dwight L. Wardell has been appointed advertising manager of Sandoz Chemical Works, Inc.

Wardell was formerly in charge of the advertising of high nickel alloys in specialized fields such as Electronics and Motor Boats for The International Nickel Company, Inc. He also edited the company's distributor magazine, "Nickelsworth." He was at one time associated with Paulsen-Webber Cordage Co. as advertising manager and was also associate editor of "Dun's Review," well-known monthly business publication.

Election of three directors by the board of The Beryllium Corporation has been announced by **Matthew J. Donachie,** president.

The three, all officers of the firm, are **Lawrence F. Boland,** vice-president sales; **William D. Gamon,** vice-president; and **Walter R. Lowry,** treasurer and assistant secretary.

Boland, who has been with Beryllium since 1935, was sales manager for three years before becoming a vice-president last March.

Gamon joined Beryllium in 1943 as a metallurgist and was elected vice-president four years ago.

Lowry, a certified public accountant, came to Beryllium in 1952 as comptroller and has held his present post for the past two years.

Edward J. Massaglia has joined Atlas Powder Company as assistant general manager of the chemicals division. Massaglia formerly was vice-president and director of Pfizer International, Inc., serving with that organization from 1951 to 1955.

Herbert H. Lett, formerly public relations manager and assistant to the manager of industrial relations of Canadian Carborundum, has been appointed technical editor of the Public Relations Branch of The Carborundum Company.

Howard Brown has been appointed divisional sales engineer by E. H. Titchener & Company, Binghamton, N. Y.

Brown's territory will include the State of Michigan, northeastern Indiana, and northwestern Ohio.

Michael Gladstone was appointed sales manager of Alloy Precision Castings Company, Cleveland, Ohio. Gladstone is a former president of Centrifi-Cast Company of New York City and is a pioneer in the investment castings field.

Also announced are the appointments of **Edward J. Vargo** as new chief metallurgist and **C. B. Beener** as chief engineer of the Alloy Precision Castings Company.

J. Deryl Case III has joined the product planning and market research section of Carbaloy Department of General Electric Company, Detroit.

Robert C. Smith has been elected vice-president in charge of operations of the Eastern Division of The Colorado Fuel and Iron Corporation.

It's still around, Sonny, but you can't see it. It's broken up too fine.

That's the way it is with oil, grease, drawing compounds, stamping compounds, and other soils removed from metal parts in a tank of . . .

Cowles NS SOAK CLEANER

No Scum on the cleaning tank to foul cleaned metal coming out. Clean it with Cowles NS Soak Cleaner and it *stays* clean.

For more information about the emulsifying power of Cowles NS Soak Cleaner for *soak-tank* cleaning before plating, enameling, other finishing . . .

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Cowles CHEMICAL COMPANY
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See Cowles FE and QC advertisements on pages 204 and 213.

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how to substitute aluminum *for copper in electrical manufacturing*

Due to the high cost of copper, repeated attempts have been made to substitute aluminum for this costly metal for electrical purposes. While it is true that more aluminum than copper is required to transmit a given electrical impulse —the lower cost of aluminum makes the substitution very attractive from a cost standpoint. Unfortunately, on all previous attempts to use aluminum for electrical conductivity the aluminum corroded, causing poor contacts and subsequent failure of the mechanisms involved.

And that's where KENVERT 40 comes in—*a chrome sealer especially designed to prevent the oxidation of aluminum* by sealing it with a film having a very low microhm resistance.

Write for complete details or send us specification data concerning your problem. We will be glad to advise you.

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PERSONALS

Dr. Wingate A. Lambertson, formerly assistant director and professor of silicate chemistry of the Institute of Silicate Research for the University of Toledo, has been appointed assistant to the manager, Research Branch of the Research and Development Division of The Carborundum Company.

Dr. Lambertson, with a broad background in the field of refractories, high temperature chemistry, and ceramic materials for nuclear reactors, will be responsible to expedite the flow of information on Carborundum laboratory developments to potential customers with emphasis on military and atomic energy applications of ceramic materials.

Author of many technical articles and active in professional groups, Dr. Lambertson is a member of honorary societies: Keramos, Phi Kappa Phi, and Sigma Xi; and the technical societies: American Ceramic Society and American Chemical Society.

Donald G. Sturges, formerly director of operations of the A.E.C. plutonium plant in the State of Washington, has been appointed manager of the New Products Branch of the Research and Development Division of The Carborundum Company.

Leslie E. Simon, Major General, U. S. Army, Retired, formerly assistant chief of ordnance for research and development of the U. S. Army Ordnance Corps, has been appointed director of the Research and Development Division of The Carborundum Company.

Major General Simon is recognized in the military and industrial world for many of the more than 400 new items developed during his administration of Army Research & Development since 1949. Some of the better known projects are the "Nike" anti-aircraft guided missile system, the 280 mm atomic cannon, the Corporal Guided Missile and the Honest John rocket.

Harry C. Martin retires from the position of director of research and development. With the company for 42 years, he served two years beyond normal retirement age by request of the president. Martin will continue as a vice-president of the company handling special assignments for the president.

Four executive appointments and a retirement have been announced by **John A. Robertshaw,** president of Robertshaw-Fulton Controls Company.

Woodford D. Miller, vice-president and general manager of the Robertshaw Thermostat Division, has been made executive vice-president in charge of the company's eastern operations. The position that Miller assumes is a new office made necessary by the continued expansion of the controls business. He will be at the executive offices in Greensburg, Pa.

Frank H. Post, assistant vice-president, succeeds Miller as vice-president and general manager of the Robertshaw Thermostat Division. Post has been with the company 18 years and is a mechanical engineering graduate of Marquette University.

George Mertz has been appointed assistant to the general manager of Robertshaw Thermostat Division and will be in charge of manufacturing at that division.

Jean V. Giesler, an executive vice-president of Robertshaw-Fulton Controls Company, will retire on February 1, 1956 as general manager of the Fulton Sylphon Division after almost 43 years on continuous service. Giesler will continue to serve as a consultant for the company.

Freeman G. Cross, vice-president, will succeed Giesler as general manager of the Fulton Sylphon Division. Cross has been with the company 28 years and is a graduate of the United States Military Academy at West Point.

Also announced was the appointment of **Richard D. Hall** as sales representative of Robertshaw-Fulton Controls Co.

Hall was with Southern California Gas Co. for more than eight years, serving in various capacities in the customer service department. His office is located at the company's Grayson Controls Division, Long Beach, Calif.

Pierson

Hall

T. H. Pierson, former assistant maintenance director of Corn Products Refining Co., has joined Eggelhof Engineers, Inc.

Pierson will head one of the process divisions and also assist in overall management of the engineering company.

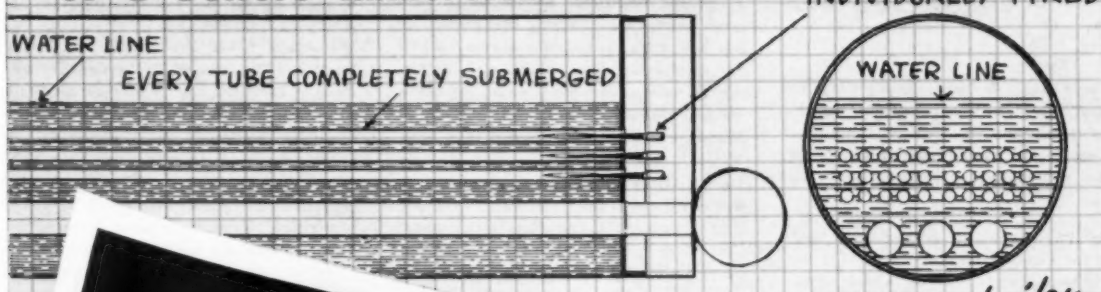
Prior to joining the company, Pierson was with Corn Products Refining for eight years. Before that, he served as foreman of the instrument department of B. F. Goodrich Chemical Co., near Beaumont, Tex.

Axel W. Hedberg has been appointed works manager of the Leece-Neville Company, Cleveland.

Homer C. Huefled has been appointed superintendent of Leece-Neville's Hamilton Avenue plant.

Huefled obtained his metallurgical engineering degree from Fenn College, Cleveland. He has been with Leece-Neville in various engineering and supervisory capacities since 1944, and was formerly associated with the Cleveland Electric Illuminating Co.

when you buy a steam boiler . . . be sure to look at the picture of a Sellers Immersion Boiler



There's no other boiler like a Sellers—

SEND FOR
BULLETIN 5206 C-00
Your letterhead will bring you this tell all, dollar saving story on all 12 sizes.

every square foot of heating surface is water backed— —100% effective!

The long, individually gas fired tubes in the Sellers Immersion Boiler are all completely submerged nearer the water level—and over the return tubes! Heat is therefore uniformly distributed through them—and directly into the water—no where else!

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In immersion heating, the needed long tubes expand and contract sufficiently on intermittent firing to crack loose any hard scale that forms on the tubes. This practically eliminates the scale problem, makes maintenance simpler and increases the boiler's efficiency.

the average flue gas travel is 15 feet!

Maximum, almost complete utilization of the exhaust heat is assured with a Sellers Immersion Boiler. This is a result of Sellers exclusive design—with the firing tubes completely submerged and *located over the return tubes,* there is a long, slow flue gas travel—an average of 15 feet! Heat can only go into the water.

There's no other steam boiler like a Sellers Immersion Steam Boiler. Its simple design gives you a package boiler unit with many other outstanding features. Minimum maintenance and maximum efficiency combine to give you years of remarkably low operating costs. Twelve sizes available!

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Blast Heaters • Immersion Automatic Water Heaters • Combustion Units • Industrial Gas Burners
Vertical Steam Boilers • Immersion Tank Heaters • Gas Combustion Equipment

PERSONALS

J. H. McVay, formerly with the Navy's Bureau of Ordnance, Washington, has joined the diamond project section of General Electric's Carboloy Department, Detroit.

The ESBEC Barrel Finishing Corporation of Byram, Conn., has announced the appointment of **E. W. Denny,** Denn-Burr Process Company, Arlington, California, as its representative in Southern California.

Denny, formerly a development engineer for General Electric Company, has put in local stocks of ESBEC Color Identified Barrel Finishing Compounds so as to give Southern California industry the fastest possible service on the products.

Horshner Cross, general manager, General Electric Distribution Assemblies Dept., announced the appointments of **Allan A. Watson** as manager—assemblies and components sales and **John S. Ryder** as employee relations specialist. Watson has been associated with General Electric since 1936 when he joined the Trumbull Electric Manufacturing Company, then a G-E affiliate, as a sales engineer.

Ryder will co-ordinate all department educational and training activities and will be responsible for maintaining an effective communications program. He will also co-ordinate all labor relations and wage administration programs.

Ryder has participated in the company's Employee Relations Development Program since 1953. During this period, he has held training assignments in marketing, engineering, finance, and manufacturing at various company plant locations. He was graduated from the University of Michigan with an LLB degree.

James H. Begley has been promoted to western division sales manager for Industrial Chemicals of the Stauffer Chemical Co. Begley, who will make San Francisco, Calif., his headquarters, had been Chicago district sales manager. He attended Notre Dame and Penn State and had been with the Stauffer Sales Department for about 12 years.

Also announced was the appointment of **Edward Beattie** as Chicago district sales manager.

Beattie is a graduate chemical engineer with experience in the fields of both production and sales of industrial chemicals.

Walter R. Roberts, for 20 years manager of silicate sales for Diamond Alkali Company, Cleveland, Ohio, retired December 31, 1955.

Succeeding Roberts is **Clifford S. Hancock,** manager of calcium carbonate sales for the past seven years, who will continue in this capacity in addition to taking over responsibility for the sale of all Diamond silicate chemicals excepting detergent silicates, which will now be handled by **C. W. Turner,** manager of detergent specialty sales.

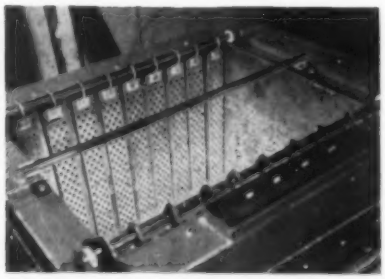
Hancock joined the company at Pittsburgh in 1925 as a clerk in the sales department. In 1929, he was promoted to secretary-treasurer of the Pure Calcium Products Company at Painesville, a Diamond subsidiary which was later dissolved and integrated with the parent organization. After two years as plant protection officer, he became manager of calcium carbonate sales in 1948.

Turner, who was appointed manager of specialty sales in December 1954, previously had supervised Diamond sales and service activities for six years in the dairy, bottling and brewing, meat packing and food processing industries.

Harold U. Daniels, who has been assistant secretary and company counsel for Diamond Alkali Company since 1948, retired December 31 to return to the practice of law in Mentor.

An Ohioan, born in Cleveland, Daniels received his early education in Mentor and Willoughby and earned a BA degree in liberal arts from Adelbert College of Western Reserve University in 1916.

High Performance Anodes



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Customers have been re-ordering Storts perforated anodes for many years, because this unique design results in remarkably efficient current distribution, and because Storts weldmanship in the fabrication of these anodes is unfailingly uniform in quality. You'll find Storts fabrication procedures equally dependable when you need anodes of special design.

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As considerable time is required to process a change of address, you are urged to advise the PLATING Circulation Department as soon as you know your new address, preferably three weeks in advance of moving.

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25 Years Ago . . .

The February 1931 issue of "Monthly Review" contained an editorial on "The Foreman Plater." It speaks of the need for proficiency among boss platers; how he should be a part of consultations on design, purchasing, inspection and production. The editorial then debauches into a eulogy of the training the AES is giving the majority of the men in charge of plating rooms.

The issue itself contains a summary of an address by W. Blum entitled "Unsolved Problems in Chromium Plating"; the Washington Convention (1930) paper read by W. Lockerbie, "Effects of Acids and Alkalis on the *p*H of Nickel Baths"; Branch News, AES News and a fascinating filler entitled, "When Fear Rules the Will." This last was from Herbert N. Classon, editor of Efficiency Magazine of London, England.

10 Years Ago . . .

The February 1946 issue of "Monthly Review" was filled with excellent material. There was a department called "Who's Who in the AES," which featured Carl E. Heussner. This was written in a rather sprightly manner and sounded as though the subject and the writer were in "cahoots." There were articles by giants in this issue: Hart and Heussner had one on "Silver Plating Aircraft Bearings." Hogaboom wrote on "Manufacture of Copper Float Balls by Electroforming." Saltonstall reported on "Bright Nickel Plating, A Review of Progress."

All in all, this was a well-balanced issue of 116 pages, digest size, with 56 pages of ads.

ELECTROS

$2.50 $3.00

ALL ITEMS HERE ARE SHOWN ACTUAL SIZE

FOR
- LETTERHEADS
- ENVELOPES
- CARDS
- PROGRAMS
- AND MANY OTHER USE

DO YOU NEED ANSWERS TO THESE QUESTIONS?

1 How can I electroclean steel at lower cost?

2 How can I find a brass cleaner that gives better protection against tarnishing?

3 How can I reduce rejects due to faulty electrocleaning of zinc die castings?

***Answer* 1** Following an Oakite recommendation, one plater made a small change in his steel-cleaning cycle and soon had two tankfuls of cleaning solution doing the work of three—and the plate adhesion was improved. *See booklet offered below.*

***Answer* 2** Oakite has a new brass cleaner that provides scientific protection against the oxygen that tarnishes brass and other copper alloys during the application of reverse current. *See booklet offered below.*

***Answer* 3** Oakite has an anodic conditioner that offers brighter plating of zinc die castings . . . with no anodic blackening and fewer rejects. *See booklet offered below.*

FREE For more information about the electrocleaning of steel, brass or zinc die castings, send for one or all of the booklets listed in the coupon.

Technical Service Representatives in Principal Cities of U. S. and Canada

OAKITE

OAKITE PRODUCTS, INC.
40 Rector Street, New York 6, N. Y.

Send me the free booklets I have checked below:

☐ "Four good steps toward better electroplating on steel"
☐ "What's NEW for electrocleaning brass and other copper alloys"
☐ "Good news about electrocleaning zinc-base die castings"

Name.....

Company.....

Address.....

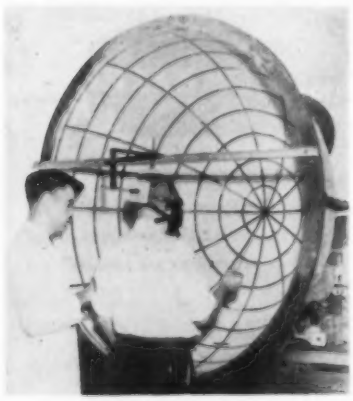
L—200. Alternators—Two four-page folders illustrating and describing two new models of its heavy duty alternators, are available from the Leece-Neville Company, Cleveland. The new units are designated as Models 5410-G3 and 5412-G6.

The free literature details both models, one used for vehicles with six-volt electrical systems, the other for vehicles with 12-volt systems. Both models assure ample current at all speeds, feature less weight and smaller size than a dc generator, long life and high reliability with less downtime and associated low cost maintenance. Another important feature is that a transformer may be attached to the alternator to give up to 800 watts of 110-volt portable power.

L—201. Protective Coatings—An illustrated catalog describing the Amercoat method of controlling rust and corrosion has just been issued by Amercoat Corporation. The various corrosion resistant coatings systems manufactured by the company are described, and suggestions in regard to the selection of the proper protective coating and the preparation of coating specifications are outlined.

L—202. Gas Mask Vision—As a help to buyers of gas masks, Acme Protection Equipment Company, is offering a special test bulletin which presents the comparative maximum usuable vision patterns of leading makes of gas mask equipment.

The source material for this bulletin, is test data obtained through the use of a Vision Scope which accurately checks all ranges of vision angles for both single and double-lens types of gas masks.



Vision Scope

L—203. Motors—"The New L. A. Line of Electric Motors" is the title of an informative, two-color bulletin published by The Louis Allis Co., at Milwaukee, Wisconsin. This attractive brochure includes photos and information on the new open drip-proof, as well as enclosed and explosion-proof, electric motors manufactured to the new NEMA standards. The Louis Allis Co. also features special motors to meet the wide variation in industry requirements. The complete line of these re-rated motors is now available.

The brochure offers comprehensive descriptions of the features of these new Louis Allis electric motors. More than 20 large sized photographs, including cutaway views, and 10 explanatory technical drawings and graph, provide the reader with essential data on performance and application features.

L—204. Shelving, Lockers, etc.—Precision Equipment Co. has just published a new catalog featuring steel shelving, lockers as well as other storage and maintenance equipment for industrial and institution use.

The new catalog also contains the popular joke column entitled, "Heard In The Locker Room" which adds additional sparkle to Precision catalogs.

L—205. Metallic Stearates For Industry—A new and comprehensive 36-page bulletin outlining the properties and uses of metallic stearates has been published by Witco Chemical Co., for the information of purchasing, technical and executive personnel of 20 industries.

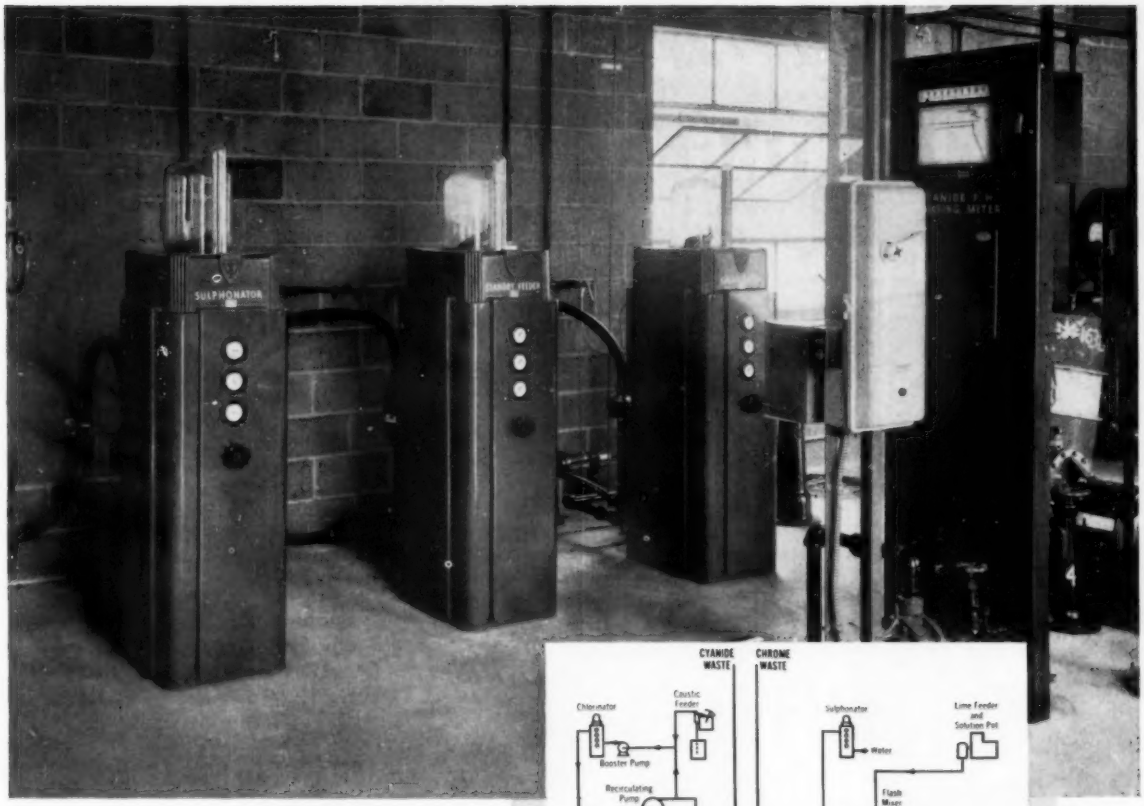
L—206. Acid-Resistant Apparel—The danger from spattering and spilling of acids and corrosive chemicals is a real and ever present hazard in many laboratory and industrial occupations. Of considerable interest in this connection is a newly published catalog and reference manual from Worklon, Inc., of New York. On its sixteen pages are contained a valuable aggregation of news, facts and illustrations relating to the very latest developments in acid-resistant and caustic-resistant work clothes. Special sections are devoted to work garments of DuPont Orlon and Union Carbide Dynel, along with a graphic analysis of the particular advantages and applications of each fabric. Additional pages contain a new group of *lint-free* acid-resistant work clothes of 100 per cent Orlon.

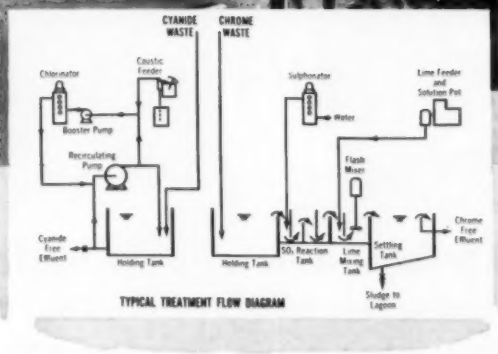
Detailed laboratory data covering acid and chemical resistance of Orlon and Dynel industrial apparel is included in the new Worklon catalog.

Electromation

In the Locker Room

Tough stuff





DAYSTROM INSTRUMENT DIVISION USES

W&T *Cyanide & Chrome Waste Treatment*

The Daystrom Instrument Division of Daystrom, Incorporated, located at Archbald, Pennsylvania, has provided a compact and efficient treating plant to destroy the toxic components of their plating waste. The treatment plant has been in continuous operation since 1953.

The cyanide bearing waste is treated with chlorine and caustic, using a **W&T** Water Diaphragm Chlorinator and a **W&T** Chemical Solution Feeder. The treatment breaks down the cyanide to harmless carbon dioxide and nitrogen gas components.

The chromium bearing waste is treated with sulphur dioxide and lime, using a **W&T** Sulphonator and a **W&T** Dry Chemical Feeder. The treatment removes the toxic chromium and other heavy metals from solution, to be disposed of as sludge.

If you would like more information on Wallace & Tiernan cyanide or chromium waste treatment, write for bulletin **RA-2120-CP.**

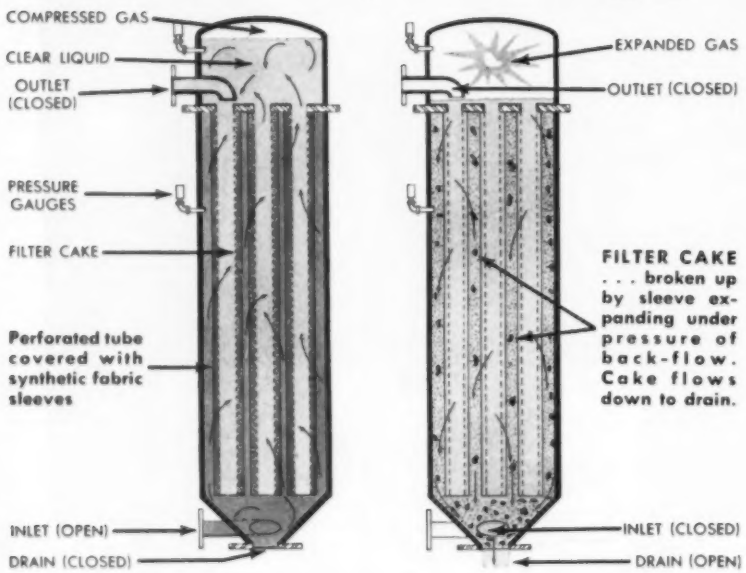
WALLACE & TIERNAN INCORPORATED

25 MAIN STREET, BELLEVILLE 9, NEW JERSEY

1-52

NEW! Hydra-Shoc* SELF-CLEANING FILTER

*Trade Mark



Industrial's new tubular filter creates own air pressure for fast self-cleaning in seconds...

- SMALL FLOOR SPACE
- ELIMINATES FILTERED WATER FOR CLEANING
- ELIMINATES BACK FLOW PUMPS

Simply shutting off the outlet valve at the end of a filtering cycle prepares the filter for Hydra-Shoc cleaning. The air trapped in the filter chamber builds up under normal input pressure. Then a set of quick opening valves simultaneously shut off the inlet and open the drain. The air, suddenly released with a hammer-like blow, expands the fabric sleeves, instantly dislodging, and forcing the filter cake through the drain in seconds.

Special bulletin now available showing operating sequence, sectional drawings and principle of operation.

SEND NOW FOR YOUR COPY OF BULLETIN NO. 114-1155.

CENTRIFUGAL PUMPS · PRESSURE FILTERS · ION AND HEAT EXCHANGERS · RUBBER LININGS · WASTE TREATING EQUIPMENT

Industrial

INDUSTRIAL FILTER & PUMP MFG. CO.

5914 OGDEN AVENUE • CHICAGO 50, ILLINOIS

TRADE-LITERATURE

L—207. Electroplating Data Chart—A time-saving chart designed to be invaluable in costing and every other operation connected with precious metal electroplating is being distributed by Technic, Inc. Purpose is to save the electroplater most of the time usually consumed in consulting various tables, and above all to insure him against errors.

The new Technic chart provides at a glance all related and comparative data on gold, rhodium, palladium, platinum, silver and nickel. Much of the information correlated by Technic has never before been compiled in a single convenient reference unit. Ingenious use of color strips minimizes the risk of confusion in hasty reading of the chart, which is sized 8½ inches x 11 inches and perforated for stringing plus margin for ring binding to permit easy inclusion in any standard notebook.

L—208. Rinse Kit—Automatic control equipment designed to save unnecessary rinsing is described in a bulletin available from Industrial Instruments, Inc., Cedar Grove, N. J. The bulletin includes the latest multi-point system whereby a single control instrument may be utilized to check up to 12 tanks simultaneously. Complete description is provided on the Solu Bridge electrolytic conductivity system of testing rinse water.

L—209. Rubber Linings—A catalog of corrosion, abrasion, and contamination resistant rubber linings for tanks, pipe, valves, and similar storage and process equipment has just been issued by Manhattan Rubber Division, Raybestos-Manhattan, Inc., Passaic, N. J. It is generously illustrated and contains many useful charts, tables and diagrams, along with specifications and suggestions covering tanks for the chemical, process, and plating industries.

L—210. $Li_2(CO_3)$—A technical bulletin on lithium carbonate has been issued by American Potash & Chemical Corporation for use in such industries as porcelain enamel manufacturing, glass and ceramic production, petroleum, air conditioning, metal alloy manufacturing and other industries.

L—211. Explosive Valves—A catalog which illustrates and describes the complete line of Conax Explosive Valves has been published by Conax Corp.

These compact, light-weight Conax Explosive Valves operate instantaneously by firing a small completely contained explosive squib. The entire operation of these valves are shown graphically in this catalog including the "normally closed" and "normally open" valves.

L—212. Germanium Rectifier—Standard models of Sel-Rex Germanium Rectifiers, from 50 to 50,000 amperes capacity, in either forced air or completely sealed water cooled design, are illustrated and described in a four-page folder published by Bart-Messing Corporation, the manufacturer.

L—213. Pumps—The complete line of Eco small rotary displacement and centrifugal pumps for chemical service is fully described and illustrated in a revised bulletin prepared by Eco Engineering Company.

L—214. X-ray, Radioisotope Protection—X-ray and gamma ray protective equipment and materials for industrial, hospital, clinic, laboratory and institutional uses of X-ray and radioisotope devices are the subjects of a brochure issued by Ameray Corporation.

L—215. "Mylar"—A booklet showing latest commercial uses and detailed physical and chemical properties of "Mylar" polyester film has been issued by DuPont's Film Department.

Illustrated by numerous photographs and charts, the booklet cites many examples of industries where this versatile plastic film has now become a preferred material.

L—216. Furnaces and Generators—Described and illustrated in the Sargeant & Wilbur catalog are exothermic and endothermic generators, ammonia dissociators, sulphur towers, dryers, tool hardening and tempering furnaces, shaker hearth furnaces, horizontal conveyor furnaces, inclined hood conveyor furnaces, pusher furnaces, strip annealing furnaces, car bottom furnaces, available S & W accessories and miscellaneous equipment.

L—217. SAMA—A membership information booklet, "You and the Instrument Industry," reflects the thinking and philosophy of officers and membership committee chairmen of the Scientific Apparatus Makers Association—key executives in the scientific instrument field. The booklet's Foreword sums up its purpose and objectives as written for non-SAMA member American instrument and apparatus companies.

L—218. Grade N-4 Brush—An 8-page booklet featuring the first general purpose industrial motor and generator brush is announced by National Carbon Company, a Division of Union Carbide and Carbon Corporation. It contains an interesting graph comparing the commutating ability versus brush life. A number of "in-service" reports define its record on main drive motors and generators, rotary converters and heavy-duty motors.

L—219. Venturi Tubes and Nozzles—Factors such as the effect of temperature, high line pressures, handling of corrosive fluids during measurement of fluid flow, indicate the need for variations in Venturi Tube design.

A comprehensive and well documented 4-page bulletin, No. 100, of interest to all engineers dealing with the measurement of liquid flow and its various ramifications, has been prepared by the Simplex Valve & Meter Company, Lancaster, Pa.

L—220. Alloys and Fluxes—A new pocket size handy book, 32-pp, 3¼ x 6¼ in, issued by All-State Welding Alloys Co., Inc., White Plains, N. Y., condenses into ready reference form the considerable data needed by buyers of specialty alloys and fluxes to help them make the wisest choices for their particular applications.

L—221. Masking—Many new time saving masking devices for industrial product finishing departments are included in a new four page Spray Paint Masking Brochure just issued by the By-Buk Company, Los Angeles, Cal. Included is a long list of "Kwiky-Dot" overlapping masking disc sizes and custom shapes made from many types of pressure-sensitive tape, some of which are made especially to release from anodized aluminum and magnesium surfaces without transferring adhesive. For the heretofore difficult task of properly masking hermetic seal electronic terminals they have developed a line of reusable Cap-Masks. For making printed circuit master drawings they make very narrow widths of black tape—down to 1/16 inch wide—in 60 yard rolls, and also many sizes of black donut type discs.

Users of Hammond Junior Automatics report 3 to 7 times faster finishing than hand methods. The Operator merely loads and unloads the machine, result . . . . faster, better and more uniform finishing, more pieces per hour with less operator fatigue.

SEND SAMPLES: Send us one finished and several rough samples. You will receive a complete Engineering Report and Production Analysis without obligation.

Hammond
of KALAMAZOO
Good Machinery Since '82

Hammond Machinery Builders INC.

1613 DOUGLAS AVENUE ★ KALAMAZOO, MICHIGAN, U. S. A.

FOR FURTHER INFORMATION, USE READER SERVICE CARD INDICATE A 220.

L—222. Non-Metallics for Pump Impellers—A report on recent findings with respect to the physical and chemical characteristics of nonmetallic impellers for displacement pumps is set forth in a new four-page folder available from Eco Engineering Company, manufacturers of positive displacement pumps for the chemical industry.

Synthetic elastomers, fluorocarbons and resinous laminates are surveyed and the influences on them of chemicals, mechanical and thermal stresses and other operational factors, are reviewed to give a general picture of the wide applicability of nonmetallic materials in pump service.

A page is reserved to illustrating and describing several industrial applications of positive displacement pumps which are using non-metallic impellers suited to particular chemical handling problems, and to showing how a Neoprene and Hypalon impeller for corrosive aqueous solutions, is manufactured.

L—223. Magnetism at Work—Homer "Space Saver" Magnetic Conveyors are described in the new illustrated eight page bulletin MC-250. "Space Saver" Magnetic Conveyors distributed by Homer Mfg. Co., offer new possibilities for completely automatic handling of ferrous parts and pieces. They convey ferrous parts and pieces up inclines as steep as 90° without need for belt cleats. These conveyors automatically feed machines, stack parts and perform parts turn-over and other handling operations. The bulletin contains details on design features, operating advantages and application possibilities for both the Homer Custom and Standard Series "Space Saver" Magnetic Conveyors. Included are pictures of the conveyors, application diagrams, specifications and ordering information.

L—224. Submerged Heater—Bulletin No. 110 on Thermal Submerged Combustion equipment is now available from Thermal Research & Engineering Corp. for general distribution. The application of Thermal high velocity burners to submerged combustion techniques offers industry one of the most effective methods for heating a liquid. The equipment is extremely compact and is unique in that combustion takes place external to the liquid being heated. Rated outputs up to 5,000,000 BTU/hr in a single tube may be obtained from standard Thermal burners.

L—225. Construction Materials—A new 32-page catalog, fully illustrated and describing its complete line of corrosion-resistant equipment, has been issued by Haveg Corporation.

The catalog features new materials of construction and evaluates equipment molded from polyvinyl chloride, epoxy glass and polyester glass, at the same time giving data on their resistance to chemicals and heat.

E—226. Nonwedging Triangles—Two new barrel finishing media have recently been placed on the market by Norton Company. The first, known as Tumblex "T" consists of Alundum vitrified bonded triangular shaped abrasive. This was developed to overcome the problem of the wedging of abrasive in parts being tumbled. The second new media, Tumblex "N" is a natural material. This is being used with good results in finishing, and especially die castings where conventional abrasives frequently cut through the outside protective layer of the casting exposing the porous structure beneath.

L—227. Abrasive Separators—The importance of proper blast cleaning abrasive separation to efficient cleaning room operations is emphasized in a 8-page booklet (Bulletin No. 1003) issued by the Pangborn Corporation, Hagerstown, Md. Four types of separators are described which handle from 33,000 to 320,000 lb/hr of abrasive. Fifteen photographs and drawings illustrate the principles of operation and the types of equipment available.

avoid costly rejects due to unacceptable coating thickness...

For quality control and acceptance tests, measure thickness of coatings on metals the easy, accurate, non-destructive way, with the . . .

AMINCO BRENNER MAGNE-GAGE

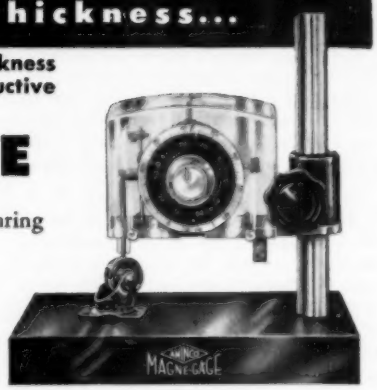
Widely used by industry and government for accurately measuring the thickness of:

1. Non-magnetic coatings (metallic or non-metallic) on magnetic base metals.
2. Nickel coatings on magnetic or non-magnetic base metals.

Measures coatings on plane, convex or concave surfaces. Gives speedy and accurate results. Easy to use by non-technical personnel.

Avoids expensive rejections due to coatings that may be too thin, or non-uniform. Eliminates the expense involved in replating or discarding specimens spoiled by destructive tests . . . every piece tested is unharmed and ready for use or shipment. Saves materials wasted by coatings thicker than necessary. Its use leads to the discovery of faults that may exist in plating methods or equipment.

Write for Bulletin 2253- F



Coating on cylindrical object being measured with Magne-Gage

AMINCO *Laboratory Instruments*

AMERICAN INSTRUMENT COMPANY, INC.

Silver Spring, Maryland • In Metropolitan Washington, D. C.

CONTROLLED GRAIN SIZE: APW Extrusion Process* controls grain size within definite limits—*minimizes shedding!*

ROLLED FLAT PLATE ANODE SECTION:

This Photomicrograph shows highly irregular, uncontrolled grain size—a major cause of shedding and resultant rough electrodeposits.

APW EXTRUDED ANODE SECTION:

Note small, fully controlled regularity of grain size that promotes uniform corrosion, smoothest electrodeposits, less rejects.

*Pat. Pending

NEW! SHAPED, EXTRUDED APW SILVER ANODES

STANDARD SHAPES:

"RECTANGULAR" "TEAR DROP" "DOG BONE"

The common problem of shedding and all of its costly results in electroplating can now be virtually eliminated with the radically new extruded, shaped silver anodes made by an exclusive APW-developed process.

The small and uniform grain size produced in the new APW extruded anodes is controlled between definite ideal limits as illustrated above. As a result, corrosion is *smooth and uniform*—with consistently smooth electrodeposits. Rejects are a comparative rarity.

The new APW extruded anode provides equally important advantages by redistribution of mass metal in scientifically determined shapes. While conventional rolled flat plate anodes quickly wear to a sharp knife edge from which silver particles break loose readily, APW shaped anodes maintain substantially rounded edges for practically the complete life of the anode. Anode area is also appreciably prolonged. After 85% by weight has been plated off, *this APW anode retains 80% of original active surface area!* You profit with the longer, useful life of the anode . . . polarization is minimized . . . there is less silver scrap to be refined.

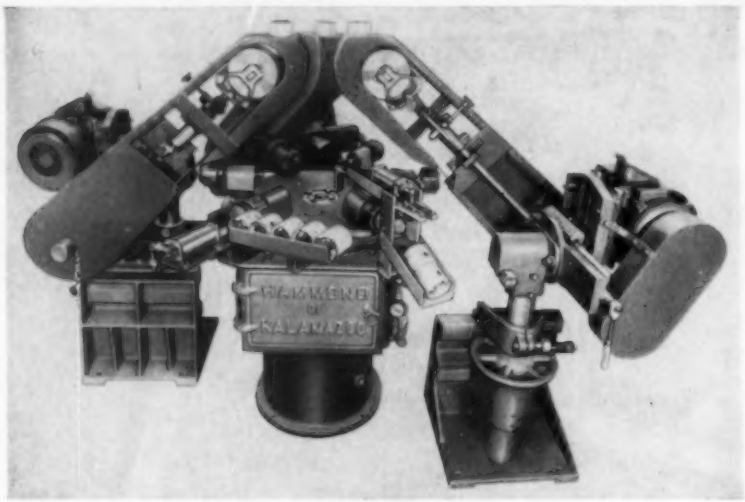
APW will develop special anode shapes to meet particular plating bath conditions. You are thus assured of utilizing the silver you buy in anodes most efficiently. Feel free to consult us on any anode problems you may have. ★ ★ ★

THE AMERICAN PLATINUM WORKS

APW

231 NEW JERSEY RAILROAD AVENUE • NEWARK 5, NEW JERSEY

Equipment and Supplies...



Automation Setup

E—228. Automation in Chamfering—Hammond of Kalamazoo has announced an automated chamfering machine for piston skirts which is their special model J-34-6 Indexing Rotary Automatic. These Hammond Automatics are being used in several plants as an integratal part of their Automatic set-up. One well known user of this type of Hammond Finishing Machine reports their savings in abrasive belt costs alone, compared to their previous hand finishing methods, will actually pay for the machine in a few months.

Another user of this type of Hammond Automatic has machines installed in the fully-automated machining processing line. Automatic pneumatic loading and automatic pneumatic ejection eliminates the need for a machine operator. This completely automated processing line automatically diverts parts to be finished to a "stand-by" machine whenever mechanical adjustments need to be made or abrasive belts changed.

E—229. Strippable Coating—Guard Coatings Corp., L. I. C., N. Y. announces the manufacture of MetalGuard, a new strippable plastic coating that protects smooth or highly polished surfaces during fabrication, handling and storage.

Like a Glove

MetalGuard is sprayed on and quickly dries to a tough, clear film that withstands all manufacturing operations, such as drawing, blanking, drilling, routing, form rolling, riveting, and shipping, and protects against the hazards of scratches, rust, oil, grease, mark-off, and splatter by acids, and alkali. When MetalGuard is peeled off, the product emerges factory fresh. MetalGuard has a tensile strength of more than 2500 lb/sq in and an elongation up to 200 per cent, making it stronger and more flexible than any other coating made.

The manufacturer claims that MetalGuard protection applied immediately after prepolishing will afford savings of at least 100 per cent over polishing as a final operation. It cuts down on refinishing, on rejects, on all the unnecessary labor operations that stem from scratched, stained or marred material.

MetalGuard can be sprayed on stainless steel, glass, vitreous enamel, chrome, nickel, decorative laminates and plated surfaces. It is also available in consistencies for brushing or dipping.

E—230. Double Oscillating Plating Barrel Cylinder—More uniform deposit of plating metal is obtained through use of a double oscillating plating barrel cylinder announced by the Belke Manufacturing Company, Chicago 51, Ill.

The improved cylinder is excentrically mounted. The ends move up and down in opposite directions, tilting the cylinder back and forth as it rotates. Instead of merely following cylinder rotation the work flows away from the high end toward the low—then reverses and flows back as the cylinder tilt reverses. All surfaces are more uniformly exposed. No work remains shielded by cylinder ends.

The added end-to-end motion also helps separate washers and other parts that tend to stick together.

E—231. For Al_2 Castings—A new eight-door stationary fixture finishing machine designed primarily for coloring of aluminum castings has been announced by Roto-Finish Co. of Kalamazoo, Mich.

The new machine, described as versatile, has a door on each flat of a single compartment cylinder Fixture pads are attached to the octagon side walls of the compartment just inside the door opening.

Fixtures are in the form of grids, which fit attached pads. After fixture is placed inside the cylinder, it is held in position during the processing operation by the pads and by pressure of the closed door pushing it firmly into the contoured pad. Fixtured parts are held by the fixture grids to effectively expose them to processing media.

Roto-Finish reported that one of the outstanding features of the machine is that it is not necessary to remove processing media or solution when removing work load from the compartment.

Processing compartments vary in size up to 48 inches long and 42 inches in diameter. Most suitable size, according to Roto-Finish, for average processing is a compartment 32 inches long and 42 inches in diameter.

The latter size, used for coloring aluminum castings with steel balls, uses a 7½ h.p. drive equipped with automatic reversing electric controls.

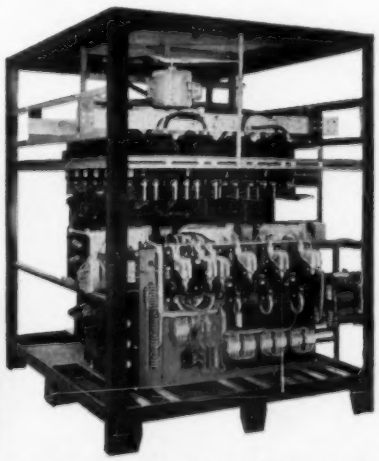
Doors are hinged for rapid servicing of fixtured parts resulting in "a most economical" operation, the company noted.

The machine gives a low cost bright lustrous finish to aluminum tool housings, food choppers and many other castings.

E—232. All-Purpose Hose—A new, advanced type of all-purpose hose has been announced by Manhattan Rubber Division, Raybestos-Manhattan, Inc., Passaic, N. J. Described as suitable for use with air, oil, water and mild chemicals, the new hose is being marketed under the trade name of Allflex.

Accurate Diagnosis . . . Proper Prescription . . .

When a rectifier "case" comes to Richardson-Allen, top flight engineers confer and diagnose the problem with the thoroughness of leading physicians. The proper rectifier is prescribed and then custom made at production prices to suit your own particular needs. Individualized service keynotes Richardson-Allen's custom relationship . . . manufacturers of the finest in rectifiers—selenium, germanium, etc. Write today for complete information.



RICHARDSON ⚡ ALLEN
CORPORATION
DEPENDABLE RECTIFIER SPECIALISTS

a manufacturing affiliate of **WESLEY BLOCK AND CO.**, 39-15 MAIN STREET, FLUSHING, N. Y.
IN CANADA: Richardson-Allen of Canada, Ltd., 370 Victoria St., Toronto, Canada

Check ✓ AND Compare

the features of
NEW LUSTER-ON
ALUMINUM SEALER
with the process
you are now using

Luster-on®
ALUMINUM SEALER

- ✓ produces a chromate film on aluminum that provides excellent corrosion protection and serves as an ideal paint base
- ✓ is an excellent substitute for anodizing in many applications where hardness is not a prime factor — gives better corrosion protection than anodizing.
- ✓ is easily applied at room temperature by dipping, spraying or brushing — treatment time extremely short.
- ✓ can be furnished in clear, yellow and dyed color finishes
- ✓ gives salt spray resistance to 600 hours
- ✓ adheres well, does not leach easily
- ✓ offers extreme economy of use
- ✓ meets government specifications MILC-5541

See for yourself the superior results obtained with new Luster-On Aluminum Sealer.

Send sample for free laboratory treatment.

THE *Chemical* CORPORATION

57 Waltham Avenue, Springfield, Mass.

EQUIPMENT & SUPPLIES

E—233. Multi-Tank Controller—A new automatic switching device for multi-tank installations in electroplating plants is announced by Industrial Instruments, Inc., Cedar Grove, N. J. The new switching device has been developed to eliminate the need for duplication of basic equipment and thus lower multi-tank automatic control costs.

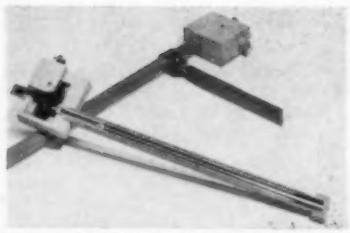
The ARPT-12 operation is relatively simple in principle. Automatically, it switches in rotation up to twelve test points. Each test point, or conductivity cell is therefore in the circuit for 10 seconds. If conditions within the tank being tested are satisfactory, the Controller switches to the next tank, which is tested for 10 seconds. This process continues until a tank is found to be outside the preset limitations. Opening and closing of valves to remedy the unsatisfactory condition is automatically accomplished when the tank is tested.

E—234. Metallizing Machine—This is one of the unique engineering features of the new Vanco Metallizing Machine. The dynamically balanced air turbine provides positive power control uniformly feeding metal wire without fluctuation, an important factor in the operation of a metallizing machine.

The turbine is automatically governed by the propulsion fluid supplied to the primary and secondary turbine, so arranged that their opposing forces are in direct proportion to the change of volume or pressure of the fluid supply, encased in a one-piece gear case that assures positive bearing alignment for the high speed turbine and component parts.

Other improved features are the self contained gas mixing chamber nozzle that completely eliminates danger of backfire, a hazard of gas operated equipment, and the new lightweight construction, (weight under 4½ pounds), that tends to eliminate operator fatigue.

Metallizer with Air Control



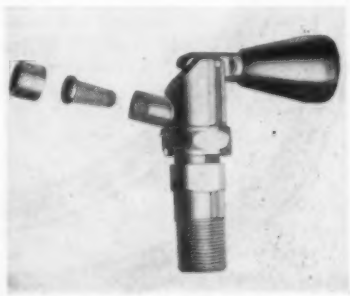
Average Depth Tank Temperature Control

E—235. Bath Temperature Regulator—A new, highly accurate and low cost temperature regulator for plating baths, impervious to plating acid deterioration or build-up, has been introduced by Elkhart Controls Co., Elkhart, Ind.

The Eltemp is entirely different in appearance, materials and design from any control now on the market. Its entire body is constructed of an acid-proof, temperature-sensitive thermoplastic called "Uscolite." Utilizing the expanding and contracting properties of this material, which, itself, is the thermal conducting medium, the Eltemp automatically regulates the operation of heating or cooling sources to a temperature tolerance of within plus or minus one degree, reducing the chance of wasteful boil-overs and resultant loss of valuable plating concentrations.

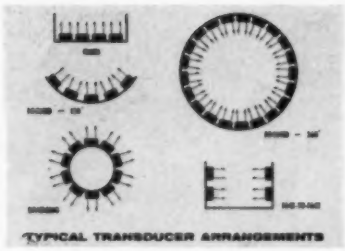
A more accurate, average-depth tank temperature—and thus improved plate quality—is produced by the Eltemp's long thermal tube, which extends deep into the plating solution and compensates for temperature changes wherever they occur, instead of at just one point.

Simply and ruggedly constructed, the Eltemp needs little maintenance. The unit is guaranteed by the manufacturer for one year. A companion solenoid valve, specially modified with a stainless steel valve plunger and seat assembly, is also offered for steam or hot water application of the new control.



Safe Screen

E—236. Flash Proof Faucet—A stainless steel faucet with a protective, corrosion resistant anti-flash screen in the nozzle has been introduced by Economy Faucet Co. Designed for use with volatile and inflammable solvents or other hazardous fluids, the Economy faucet is manufactured in 304 stainless steel throughout, with chemically inert Kel-F seal rings.



TYPICAL TRANSDUCER ARRANGEMENTS

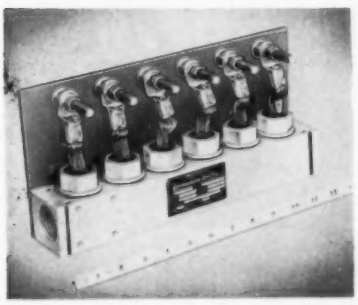
E—237. Ultrasonic Equipment—Hermetically sealed ultrasonic power transducers and improved generators operating at 40 kc/sec have been announced by Branson Ultrasonic Co. Sharply reduced cost and versatile design of the transducer makes it possible to apply ultrasonic energy to many applications which had previously been considered impractical or economically unfeasible.

The large, uniform radiating surface of the transducers makes them particularly suitable for ultrasonic metal cleaning applications, such as removal of buffing compounds, radioactive contamination, soldering flux, plaster, carbon smut etc. The transducers can also be used for other processes in liquids which benefit from ultrasonic energy, such as quenching, plating, pickling, descaling, and dyeing.

The standard LF-15 transducer has a radiating area of 2⅝ inches x 6 inches. The modular transducer design facilitates a wide choice of arrangements, including flush transducer banks, focussing and diverging. Ultrasonic energy of the proper intensity can be applied as required by the shape of the part.

The immersible transducers lend themselves readily to installation on conveyorized machines.

Generator-transducer combinations are available, with radiating areas of 30 sq in to 8 sq ft.



Li'l Powerhouse

E—238. Ge Rectifier—Occupying a volume of only 190 cubic inches, this small, compact 30 kw liquid cooled Germanium Power Rectifier has been especially designed by International Rectifier Corporation for ac to dc power conversion where high power output, high efficiency, negligible aging and small unit size are required.

This new product may be connected as a three-phase half wave unit, for a six-phase star operation, three-phase center tap, or as a dual three-phase half wave unit to be used with interphase transformers. Depending on the circuit, output currents of 540 to 750 maps can be obtained. The assemblies can be supplied for input voltages of 26v to 66v rms maximum.

The improved rectifier design provides for superior cooling using a liquid coolant (water, oil, etc.) at a maximum inlet temperature of 30° C and a volume of 1 to 4 gal/min.

The new liquid cooled germanium power rectifier is applicable for all types of d-c load requirements except those requiring heavy surge currents and those subject to heavy intermittent overloads or occasional short circuits. Unlimited operation life can be expected over a temperature range of minus 55° C to plus 75° C maximum when equipment is designed to operate within specified voltage, current and temperature rise ratings. This temperature range provides ample safety factor for all normal industrial and commercial applications.

E—239. Chromate Conversion Coating for Cd—The Chemical Corporation of Springfield, Mass. has added Luster-On NL-C to its line. It is a chromate coversion coating for cadmium that will produce a bright clear finish with corrosion protection. This material is particularly useful for installations where space is a factor. By using this material two tanks are eliminated from the cycle that are normally required in a chromate leaching cycle.

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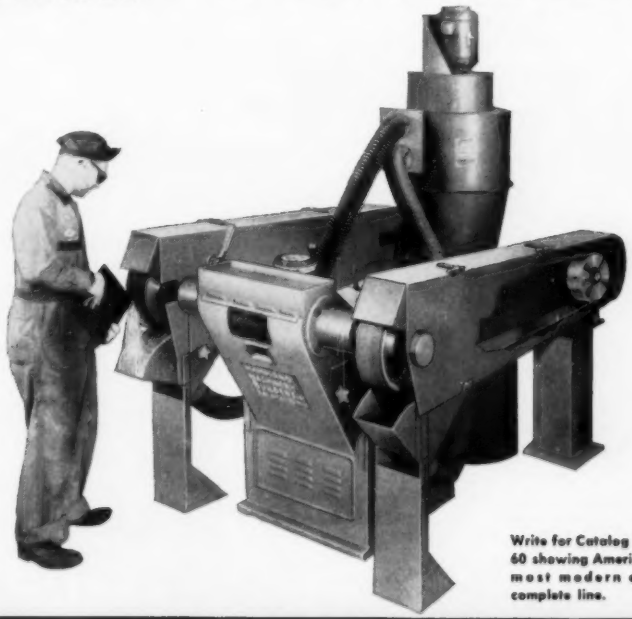

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EQUIPMENT & SUPPLIES

E—240. Coagulant Aids—New coagulant aids, designed to speed up water clarification processes, have been introduced by Hagan Corporation, Pittsburgh chemical and control engineering company, as a result of research and development by its subsidiary, Hall Laboratories, Inc.

The Hagan Coagulant Aids make coagulants such as aluminum and iron compounds more efficient in removing turbidity from water. The aids cause flocs of aluminum or iron hydroxides, which enmesh finely divided sediment, to form more quickly and to settle more rapidly. The materials also make it possible to clarify raw water over a broader alkalinity or pH range than would otherwise be possible. Even without coagulants, the aids help in the formation of larger, faster-settling precipitate in lime soda softeners.

E—241. Multi-Compartment Barrel—The Roto-Finish Company has announced developments of a new series of barrel finishing machines for finishing of parts which previously could not be finished with conventional barrel methods. These new machines are called the EWM Roto-Finish Multiple Compartment Machines and are designed around one cylinder with from 1 to 20 separate compartments.

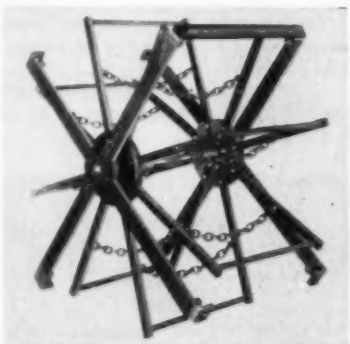
All compartments are served by a single door running the full length of the cylinder. The door is offered in three styles—one-flat wide, two-flats wide and three-flats wide full diameter opening. On the longer machines a special electrically operated jib crane is included as part of the machine in order to handle the large door. Also, a new integrated door locking system is employed so that all locks may be released from one end of the machine.

The principal difference in processing with this compartmentized machine, as

Compartmentalized Barrel

opposed to the regular type barrel finishing machine, is that only one part is processed without fixtures and unattached in each compartment instead of finishing many parts in a bulk load. Equipment will often utilize an octagonal cylinder from 16 to 36 inches in diameter and 6 feet or more long, depending on the number of compartments in the cylinder.

E—242. Universal Rack—The new Lorco universal tumbling fixture can be ordered to fit most sizes of standard horizontal barrels. It is built for assembly within the compartment. The outside framework, of heavy-gage machined steel, is adjustable to insure a tight fit inside the barrel. The inner portion is a revolving "ferris wheel" with several work stations. Each station will accommodate one large part or several smaller parts. Rods or chains to hold parts are provided with rubber hose to prevent damage to the work parts.



Tumbling Fixture

To load, the rack is rotated in the drum until one of the work stations is opposite the door opening. Parts are hung from the chains or spring-loaded rods, and the rack is revolved to the next station. When rack has been fully loaded, its ferris wheel part is clamped to the outside framework. The special clamp furnished with the rack prevents any movement while the tumbling barrel is in motion. After tumbling, the clamp is unloosened to allow the parts to be unloaded by revolving the successive work stations to the door opening. Rack is furnished with rods or chains, as required, and with special clamp.

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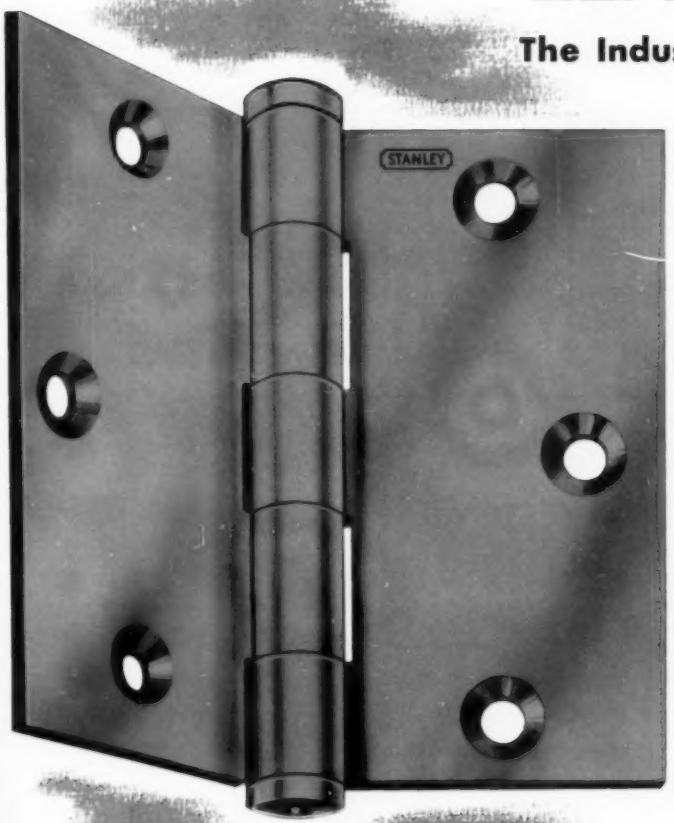

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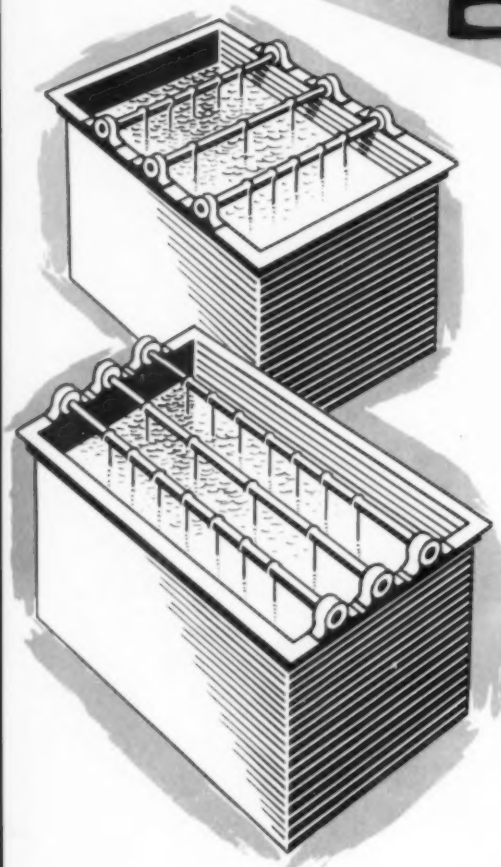

Lea-Ronal's Research Group has done it again — developed another process to help reduce your plating costs while producing better products!

Lea-Ronal High Speed Brass will produce a uniform lustrous brass color over a wide current density range (5-100 amp/sq. ft. Hull Cell). In still tank production, results show that you will obtain a cathode efficiency of 95% or over with a range of 5 to 25 amp/sq. ft. in addition to high luster. An example of the very rapid rate of deposition is that at 25 amp/sq. ft. for 5 minutes the deposit will be 0.0002" thick.

Do you want lower operating costs and increased production? This Lea-Ronal High Speed Brass Process using Brass-Glo has been providing those advantages to its users for over a year. It's well-proved. One tank will do the work of five with a conventional brass solution. With less equipment and floor space and with fewer solutions to maintain, you always will have savings. Coupled with greater production this can't help but mean better and less expensive operations and you will always get better deposits.

If you are plating brass you can benefit from using Brass-Glo. Full details will be sent on request.

* *Patents pending.*

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high in sulfur and arsenic. Careful autoclaving of metallic concentrates is claimed to reduce As a and S content to under 2 per cent. . . . A $1 million tantalum-columbium expansion program will be begun immediately by Fansteel Metallurgical Corp. . . . Esters of titanic acid (such as isopropyl, n-butyl, 2-ethylhexyl, 2-ethylbutyl and stearyl alcohols) were found to be very effective in promotion adhesion of paints, plastics and rubber to metal and should be valuable in making cross-linked polymers because of the ease with which titanium esters react with polyhydroxy compounds. Used with maleates and methacrylates, they are highly effective catalysts in alcoholysis and ester interchange reactions. The acrylates of titanium are worth developing as masonry-sealers and for water repellency in wood and paper.

ALUMINUM—(99 per cent pure plus ingot)	24.40
CADMIUM—(Platers quotation)	$1.70
CHROMIUM—Electrolytic Cr (99 per cent), Fe (0.3 per cent max), C (20 per cent max)	$1.27
Less than ton lots	$1.29
COPPER—Electrolytic, domestic	43.00
LEAD—(Common, New York)	16.50
MAGNESIUM—(Ingot, F.O.B. Newark)	33.90
(Sticks, 1.3 in diameter, 100 lbs or more)	53.00
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Electrolytic Cathodes (sheets loose)	64.50
PLATINUM—(refined per oz)	$97.00-$107.00
RHODIUM	$120.00-$125.00
SILVER—New York (per oz)	91.00
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(Prompt Delivery)	106.75
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(Feb. Delivery)	104.50
(March Delivery)	103.37½
(April Delivery)	103.00
ZINC—Hygrade (delivered)	14.85

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A 164 – 55.	Spec. for Electrodeposited Coatings of Zinc on Steel
A 165 – 55.	Spec. for Electrodeposited Coatings of Cadmium on Steel
A 166 – 55 T.	Spec. for Electrodeposited Coatings of Nickel and Chromium on Steel (Tentative)
A 219 – 54.	Methods of Test for Local Thickness of Electrodeposited Coatings
B 117 – 54 T.	Method of Salt Spray (Fog) Testing (Tentative)
B 141 – 55.	Spec. for Electrodeposited Coatings of Nickel and Chromium on Copper and Copper-Base Alloys
B 142 – 55.	Spec. for Electrodeposited Coatings of Nickel and Chromium on Zinc and Zinc-Base Alloys
B 177 – 55.	Rec. Practice for Chromium Plating on Steel for Engineering Use
B 183 – 49.	Rec. Practice for Preparation of Low-Carbon Steel for Electroplating
B 200 – 55 T.	Spec. for Electrodeposited Coatings of Lead on Steel (Tentative)
B 201 – 55 T.	Spec. for Chromate Finishes on Electrodeposited Zinc, Hot-Dipped Galvanized, and Zinc Die-Cast Surfaces (Tentative)
B 242 – 54.	Rec. Practice for Preparation of High-Carbon Steel for Electroplating
B 252 – 53.	Rec. Practice for Preparation of Zinc-Base Die Castings for Electroplating
B 253 – 53.	Rec. Practice for Preparation of and Electroplating on Aluminum Alloys
B 254 – 53.	Rec. Practice for Preparation of and Electroplating on Stainless Steel
B 281 – 53 T.	Rec. Practice for Preparation of Copper and Copper-Base Alloys for Electroplating (Tentative)
B 287 – 54 T.	Method of Acetic Acid-Salt Spray (Fog) Testing (Tentative)

**Sponsored by ASTM and AES and revised to September, 1955*

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REPORTS FROM ALL OVER . . . STRIPPED, CLEANED, DEG

1955 proved to be the greatest year ever experienced by all industry. However, the nickel situation worsened and nickel remained in short supply. Aluminum mills failed to fill the need despite record-breaking output. Copper, lead and zinc have started the new year also in short supply. This situation will not grow better in the coming years. By 1975 the average US consumption of metals will rise 90 per cent. Titanium, unknown just 20 years ago, is expected to increase 325 per cent. Ingenuity, better use of available metal, greater technical progress and special methods will therefore remain at a premium through the coming years.

The Chromacron apparatus for vapor phase chromatography was advertised by Podbielniak, Inc., Chicago as being designed for simple and rapid analysis of gases and liquids boiling below 300° C, with separating columns up to 2,000 plates and packed with selective solid absorbent or with liquid solvent supported on inert packing. . . . A new type aluminum polish for ending "black rust" is claimed by Ellenson Testing & Res Labs, N. Y. to form a super-finish on the surface which produces a result "not unlike" anodizing. It is also claimed to protect aluminum from further corrosion for up to 6 months. . . . Kaiser Aluminum & Chemical Corp's new $280 million expansion program will make it the second largest US aluminum producer (654,000 ton/yr of primary aluminum). . . . Low frequencies are much more effective than high frequencies in ultrasonic cleaning, according to A. Murdoch, Jr., Port Washington, N. Y. . . .

Electroplaters can get smoother copper plates efficiency baths, when copper is supplied from high density cast anodes rather than from ordinary electrolytic-copper anodes, according to W. Sa Battelle Memorial Inst. . . . Strength of adhesive- joints will approach the cohesive strength of the itself, if metal surfaces are properly treated, accordi Inst., Philadelphia. When using high-strength adhe of the metal joints can be correlated with thickne taminating film. Rag-wiped titanium surfaces strength of 1400 psi; but, after degreasing, stren 4,000 psi; and, after completely removing the org leaving only an adsorbed water film, joint strength 7,000 psi. . . . A test plant to regenerate steel mi have polluted streams will be built by Blaw-Knox firms at the Niles, O., plant of Republic Steel. . . . a suitably open lattice or grid holds back molecul wrong shape or size but allows molecules of the r size to pass through easily and be freely sorbed w interstices. . . . Best combinations of protective e hardness and flexibility were given by an epoxy bas a standard stoving scheme to DTD-235. Butyle t and a silicone paint gave poor protection. . . . A 10 plant to determine commercial possibilities of the extracting cobalt, copper, nickel and iron from l will be built by Metallurgical Resources, Inc. for

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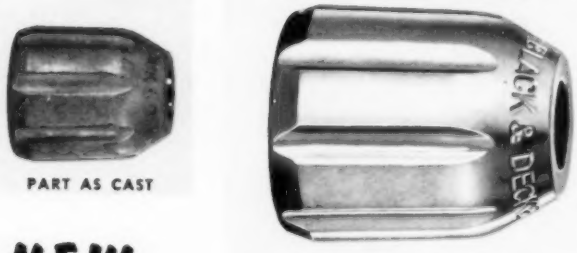

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brightens zinc die castings by chemical polishing, protects against corrosion

NOW, FOR THE FIRST TIME you can get a brilliant, decorative finish directly on zinc die-cast parts . . . without mechanical finishing, without electroplating! The luster is provided by the *chemical polishing* action of new Iridite (Cast-Zinc-Brite) solution. Even surface blemishes, such as cold shuts, are brightened by this new process. No electrolysis. No special equipment. No specially trained personnel. Just a simple chemical dip for a few seconds and the job is done. And, this new Iridite has been *tested and proved* in production.

CORROSION RESISTANCE, TOO! New Iridite (Cast-Zinc-Brite) provides exceptional corrosion resistance for bright-type chromate finishes . . . also guards against blueing or darkening by eliminating zinc plate formerly required in bright chromate finishing of zinc die castings.

AS A BASE FOR ELECTROPLATING—Lower mechanical finishing costs are possible where plated finishes are *required* since the brightness provided by this new Iridite may be sufficient.

LET US SHOW YOU what Iridite (Cast-Zinc-Brite) can do for you. Send us at least a half-dozen typical zinc die-cast parts for FREE PROCESSING for your own tests and evaluation. Or, for immediate information, call in your Iridite Field Engineer. He's listed under "Plating Supplies" in your classified 'phone book. *IMPORTANT: when you give us samples for test processing, please be sure to identify the alloy used.*

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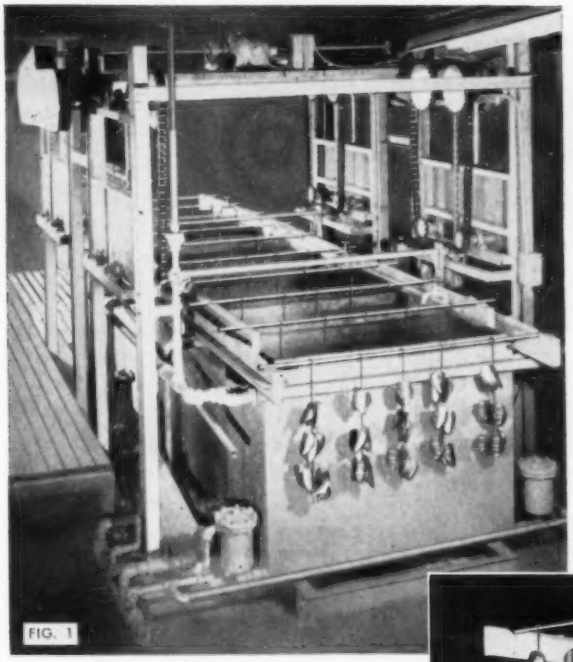


FIG. 1

NEW Automatic TRANSFER MACHINE for Pre-Plate Processing

One unit saves labor of 3 to 6 men.

Extremely flexible—different metals such as steel, brass and even die casting can be processed with the same set-up.

Shops that have BELKE Automatic Transfer Machines use them for most of their work.

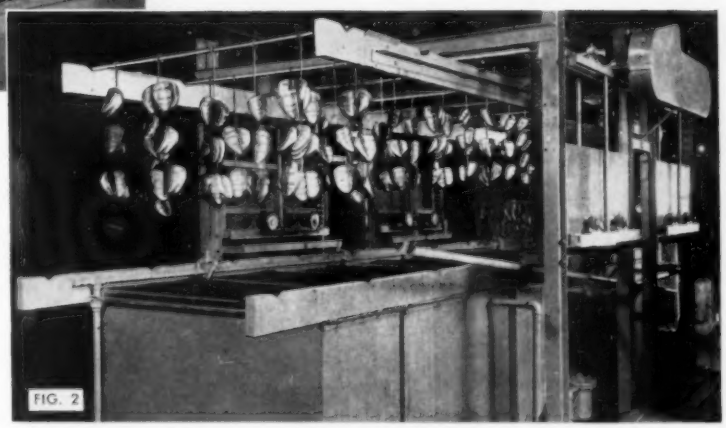


FIG. 2

Fig. 1. Loading End. Loaded racks are hung on rod placed in saddles on transfer frame. At end of each processing period the machine automatically lifts all rods and advances each one tank in the processing cycle.

Fig. 2. Delivery End. Picture shows transfer frame elevated in the transfer operation. When the frame comes down the last rod, which carries parts from the last tank in the processing cycle, will be placed in the unloading saddles on the frame which extends beyond the last tank.

Features

- Affords practically any required cycle for plating, painting, etching, etc.
- Flexible. Easily adjusted to "skip" tanks for processing articles of different basic metals without changing solution.
- Automatic Timing. Easily set for any processing period from 10 seconds to 20 minutes.
- Uniform Processing. The automatic timer doesn't forget — is not called away. Spoilage is avoided.
- Helps Foreman maintain full production. At a glance he can see partially loaded rods or empty saddles—then locate the cause.
- Available with conveyor-equipped plating tank to which processed work is automatically transferred.

The BELKE Automatic Transfer Machine stops the backaches and high labor costs of processing parts for plating.

The machine automatically lifts and transfers work from tank to tank through the entire pre-plating cycle such as electrocleaning, tepid running rinse, anodic electroclean, cold running rinse, acid bath, cold running rinse, cyanide bath, cold running rinse. Practically any cycle can be had.

The Transfer Unit can be adjusted to "skip" tanks as desired for processing articles of different metals such as steel, brass and die castings. This flexibility makes practical automatic processing of a great range of varied work.

For further labor-saving, a conveyor-equipped plating tank can be furnished with the BELKE Transfer Unit. The Transfer Unit automatically transfers processed work to the conveyor and the work is completely plated while moving through the plating tank.

Send for literature or see your BELKE Service Engineer.

Belke Manufacturing Company, 947 N. Cicero Ave., Chicago 51, Ill.

EVERYTHING FOR PLATING PLANTS

EQUIPMENT & SUPPLIES

E—243. Portable Burnishing Barrel—A new portable type Mercil Burnishing Barrel has been introduced by Hanson-Van Winkle-Munning Co. The advanced design of the barrel makes it readily adaptable to light weight work such as jewelry polishing and the deburring and cutting down of other types of material.

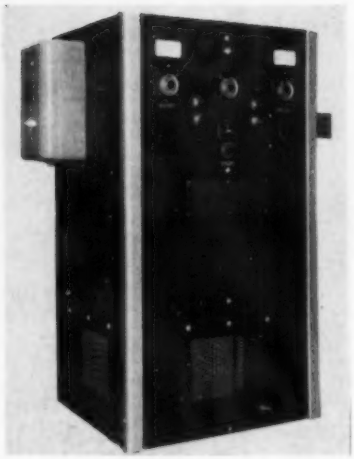
The Mercil Burnishing Barrel is light because it is entirely made of Plexiglass. Its compact size, 8 inches in diameter and 8 inches in length, and its light weight allow it to be easily carried from place to place. Rotating in ball bearing bushings, the new type barrel is powered by a ⅓ hp, 5000 rpm, 115 v motor. The speed is controlled by a rheostat which permits variable settings up to 60 rpm when loaded.

The work load is determined by the size of the pieces to be processed. The barrel can handle 5 to 10 pounds of work and 20 to 25 pounds of balls. A loading hopper and unloading stand are available as accessories. The new burnisher has a rubber gasket cover retained by spring clamps to insure a tight fit.

E—244. Automatic Programming Rectifier—Any sequence of plating operations can be made completely automatic through the use of Rapid Electric automatic programming equipment.

Either Selenium or Germanium power units can be combined with program timing equipment for automatic operation of any series of plating steps.

A number of synchronous timers housed in a single cabinet with interlocking circuits and controls will start, stop and time any number of separate operations



Program Timer

in any sequence, without supervision or interruption.

The use of such timers, plus a motor-driven auto-transformer controls the output in pre-set time intervals for complete prestrip and finishing operations.

The automatic program equipment can be housed in a single cabinet which measures 18 inches x 14 inches x 7 inches or can be integrated within standard rectifier cabinets.

Simple application to any existing installation plus the elimination of supervision and manual control are additional features of this equipment.

E—245. Tungsten Filaments—Micro-Wire Stranding Co. is producing single strand and stranded tungsten filaments designed to give more effective flashes, maximum evaporating capacity with a uniform flow of metal, and longer life with minimum breakage. Tungsten filaments have found a ready application in vacuum metallizing. With a higher melting point —3400° C—than any other metal, tungsten has proved an ideal source for required heat. With precision equipment, Micro-Wire filaments are more uniformly coiled to closer tolerances at lower costs than are available from conventional hand operations.

These sturdily built filaments, designed for specific metallizing jobs, are made from 99.95 per cent pure tungsten. Chemically clean surfaces are free from cracks, grooves, lubricants, oxides, foreign substances or other irregularities. Reel wound, cut lengths, or uniform finished coils, Micro-Wire filaments are produced in single strand or stranded cable from 0.0005 inch to 0.250 inch.

E—246. Liquid Buffing Compound Cleaner—New Lixol, a water-soluble liquid cleaner to remove all types of buffing compound from all ferrous and non-ferrous metals, has just been released for sale

(*Continued on page 206*)

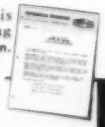
Put your metal cleaner *behind* the soil—between the soil and the metal—and you'll soon have the soil *off* the metal. That's the way you'll clean metal parts with . . .

Cowles NEW QC WASHING MACHINE CLEANER

Cowles NEW QC Washing Machine CLEANER penetrates through films of oil—crusts of drawing and stamping compounds—even into deeply recessed parts—pries the soil loose where pressure jets can't reach.

Improved penetrating, wetting, and emulsifying action in your washer without objectionable foaming.

GET THE COMPLETE STORY on this *brand NEW* Cowles QC Washing Machine Cleaner. **Send This Coupon.**



Cowles Chemical Company
7018 Euclid Avenue
Cleveland 3, Ohio

Please send Cowles QC Bulletin

Name_____

Company_____

Address_____

City_____ State_____

Cowles CHEMICAL COMPANY
CLEVELAND 3, OHIO

See Cowles NS and FE advertisements on pages 183 and 213.

WYANDOTTE CHEMICALS

Specialists in Metal-Cleaning Products

Samuel H. Davis, general foreman, checks finish on bumpers.

Rheem Automotive Company cuts production costs with Wyandotte B.N.

The Rheem Automotive Company, of Vernon, California, is a leading manufacturer of automotive springs and bumpers. Its new plant, now under construction at Fullerton, California, will house the largest plating installation on the West Coast.

Because of its high manufacturing standards, Rheem insists upon high quality from all its suppliers. In the manufacture of automobile bumpers, where a gleaming finish is so important, great care must be exercised in the metal-cleaning operations. Wyandotte B.N. helps make this job easier and more economical.

Wyandotte B.N. is a versatile cleaner that does many jobs well. Rheem Automotive Company uses it as a soak cleaner, and as both an anodic and cathodic electro-cleaner. They report excellent cleaning results. Wyandotte B.N. helps them keep cleaning costs low, too, because it has an exceptionally long cleaning life. And, with Wyandotte B.N., rejects are cut to a minimum!

In addition to Wyandotte B.N., Rheem Automotive Company uses three other Wyandotte metal cleaners: Industrial No. 38, P-1075, and MK.

Wyandotte's complete line of industrial cleaning products can help you improve the quality of *your* finishes. Your Wyandotte representative can show you how to get top efficiency and lower use-cost in *all* of your industrial cleaning operations. Give him a call today. *Wyandotte Chemicals Corporation, Wyandotte, Michigan. Also Los Nietos, California. Offices in principal cities.*

Wyandotte CHEMICALS

J. B. FORD DIVISION

Available for Immediate Shipment, Attractive Values

The following excellent rebuilt and guaranteed electroplating motor generator sets and rectifiers, with full control equipment:

PLATERS

1—7500/3750 AMPERE, 9/18 VOLT, **HANSON-VAN WINKLE-MUNNING,** Synchronous.
1—6000/3000 AMPERE, 6/12 VOLT, **CHANDEYSSON,** Synchronous, Exciter-in-head.
1—5000/2500 AMPERE, 6/12 VOLT, **CHANDEYSSON,** Synchronous, Exciter-in-head.
1—4000/2000 AMPERE, 6/12 VOLT, **CHANDEYSSON,** 25° C., Exciter-in-head.
1—3000/1500 AMPERE, 12/24 VOLT, **CHANDEYSSON,** Exciter-in-head.
1—3000/1500 AMPERE, 6/12 VOLT, **COLUMBIA,** Synchronous.
1—2500/1250 AMPERE, 9/18 VOLT, **ELECTRIC PRODUCTS,** Synchronous, Exciter-in-head.
1—2000/1000 AMPERE, 9/18 VOLT, **ELECTRIC PRODUCTS.**
1—1500/750 AMPERE, 6/12 VOLT, **HANSON-VAN WINKLE-MUNNING,** Synchronous, Exciter-in-head.
1—1500/750 AMPERE, 12/24 VOLT, **CHANDEYSSON,** Synchronous, Exciter-in-head.
1—1000/500 AMPERE, 6/12 VOLT, **ELECTRIC PRODUCTS.**

ANODIZERS

1—4000 AMPERE, 40 VOLT, **CHANDEYSSON,** Exciter-in-head.
1—1000 AMPERE, 40 VOLT, **CHANDEYSSON,** 25° C.
1—1000 AMPERE, 30 VOLT, **IDEAL,** Exciter-in-head.
1—750 AMPERE, 60 VOLT, **HANSON-VAN WINKLE-MUNNING,** Synchronous, Exciter-in-head.
1—500 AMPERE, 25 VOLT, **CHANDEYSSON,** Synchronous, Exciter-in-head.

RECTIFIERS

1—2000/1000 AMPERE, 6/12 VOLT, **G. E.,** COPPER OXIDE, with Manual Control.
1—2000/1000 AMPERE, 6/12 VOLT, **G. E.,** brand new selenium stacks, with "On-load" Automatic Voltage Regulator.
1—**GREEN SELECTOPLATER,** 1800 AMPERE, 12 VOLT, 220/3/60.
2—BRAND NEW 2000/1000 AMPERE, 6/12 VOLT, **G. E.** COPPER OXIDE RECTIFIERS, with Controls.

SPECIAL

1—TOLLHURST CENTRIFUGAL DRYER, 20" dia. basket, with Steam Heat
1—H-VW-M Full-Automatic Plating Machine, 87' long, 39" lift, was used for copper and nickel.
1—H-VW-M Full-Automatic Plating Machine, 87' long, 39" lift, was used for chrome.
1—H-VW-M Full-Automatic Plating Machine, 40' long, 39" lift, was used for cleaning.
1—Production Pipe Polishing Machine, Model 101, Motorized.
2—**RONCI** Enamelers, No. R-100, and No. R-200.
1—**K-4** SEMI-AUTOMATIC BUFFING MACHINE.
3—**U. S.** ELEC. TOOL, Mod. 110, TWIN 15HP POLISHING LATHES.
1—MODEL "A" PRESSURE BLAST.

Above is partial list only. Write to us for all your requirements for Plating, Anodizing and Metal Finishing

WIRE—PHONE—WRITE

M. E. BAKER CO.

25 WHEELER STREET

Kirkland 7-5460 **CAMBRIDGE 38, MASS.**

EQUIPMENT & SUPPLIES

by Cowles Chemical Company, Cleveland, Ohio. Broad patent coverage has been applied for on this unique product.

A new development resulting from five years of investigation at Cowles Research Laboratories in Skaneateles Falls, New York, New Lixol is mildly alkaline (pH about 9 at working concentrations) but it is not a conventional alkaline cleaner. Nor is it a conventional solvent. New Lixol is nontoxic and noninflammable.

New Lixol is used in substantially the same set-up employed with an alkaline soak cleaner. Tank make-up calls for two gallons of New Lixol in 98 gallons of water (2 per cent by volume). Working temperature is 170° F. Minimum immersion time is usually three minutes.

When buffing compound removal precedes storage, shipping, or further handling, a conventional spray-rinse after immersion in New Lixol is sufficient to remove loosened sediment from recessed and inaccessible areas. When the washed parts are to be phosphatized, painted, or similarly finished, the soak in New Lixol is followed with a spray-clean and spray-rinse. Before plating, the soak in New Lixol is followed with a spray-clean, a spray-rinse and a light reverse-current electrocleaning operation. New Lixol is used successfully in hard water.

E—247. Plastic Aluminum—A new plastic aluminum described by its manufacturer as effective for patching and mending on all kinds of metal surfaces is now being marketed nationally.

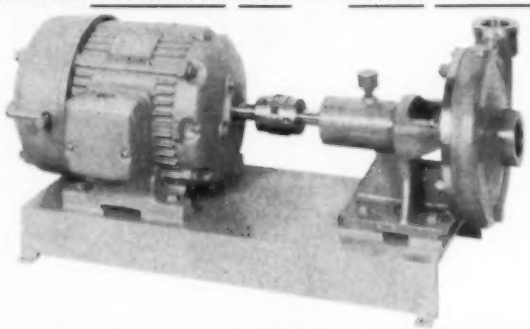
The product, packaged in a four-ounce fold-up metal tube, is "real metal in paste form," the maker says, and can be used just as it comes from the tube. No heat is required to spread it, yet once it hardens, it will withstand heat up to 600° F. It is also waterproof and gasoline-proof.

The plastic aluminum should be applied only to clean, dry surfaces from which all loose rust has been removed. It can be spread with a spatula over the area needing repair and will dry metal-hard in three to four hours. Thick applications may take overnight to dry. Filing or rubbing the patch with emery cloth will result in a bright silvery effect.

Long Life for Zn—

The Chemical Corporation of Springfield, Mass. has added Luster-On Stain Preventive to its line. It is designed for the large volume producer of zinc plating. A very economical finish to maintain uniform long shelf life. Suggested uses are on electrical conduits, outlet boxes, plated sheet stock and wire screening.

" . . . this Pump has a Patented Mechanical Seal to Reduce Maintenance



. . . and is Tailored for All Plating Requirements!"

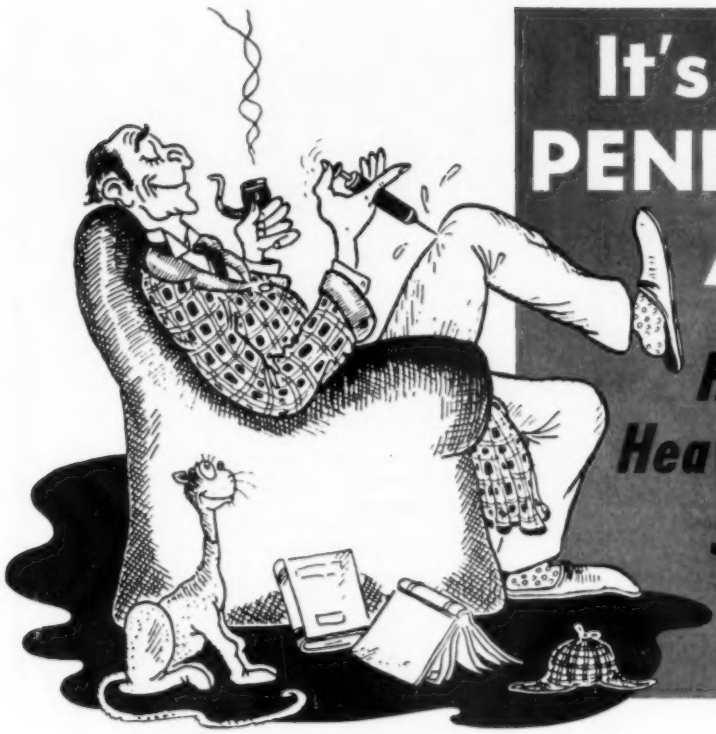
Steadfast announces the addition of a line of Service Pumps for the Plating Industry. These high efficiency centrifugal pumps designed by a proven manufacturer with 35 years experience is your assurance of precision fits and quality workmanship.

Available in the following Materials: Cast Iron, Stainless Steel, Durimet, Hastelloy, Bronze, Hi-Temp Lucite and others depending upon requirements. Pump Ratings from 300 gph to 12,000 gph. (We invite your inquiries.)

Patented mechanical seal eliminates the troublesome stuffing box and costly down-time. Tests on this mechanical seal have shown two years continuous 24 hr/day operation without any maintenance required.

STEADFAST INDUSTRIES, INC.

4731 W. Madison St., Chicago 44, Ill.
(In Canada, Write Armalite Co. Ltd.)



It's the PENETRATING ACTION!?

How AHCOLOID Heavy Duty Cleaners SOLVE the Toughest Soils

Sherlock Holmes knew a thing or two but he never dreamed of solving a case as fast as Ahcoloid Heavy Duty Cleaners solve cases of industrial soil! Drawing or stamping compounds, heavy oil or grease films, and industrial waxes come clean in no time when these fast-acting cleaners go to work. Whatever your cleaning problem, one of these cleaners is your best solution . . .

AHCOLOID CLEANER 202-A

This mild, low-pH soak cleaner is excellent for use on steel and most types of nonferrous metals, particularly to remove oily films with mineral oil base. Removes heavier oil films than most soak cleaners.

AHCOLOID CLEANER 202-B

Similar to 202-A but with higher alkalinity. Good to remove semi-solid, greasy, or waxy soils on steel and ferrous metals.

AHCOLOID CLEANER 213-B

This unique, low-pH soak cleaner is very mild . . . ideal on steel and stainless to remove drawing or stamping compounds and die lubricants with high metallic soap content . . . also drawing lubricants on phosphated surfaces.

AHCOLOID CLEANER 215

Economical soak cleaner for steel and nonferrous metals. Its low-foaming characteristic makes it ideal in tumbling equipment or for still tank processing. Many types of soil respond best to this cleaner.

Often cleaning problems arise from the unknown nature of the materials which cause the soil . . . why not submit your problem to our laboratory for testing and recommendations . . . without obligation.

CHECK AND MAIL TODAY

For more information about any of the above cleaners, check the appropriate box or boxes, clip, and mail to Apothecaries Hall Company, 22 Benedict Street, Waterbury, Connecticut.

202-A ☐ 213-B ☐

202-B ☐ 215 ☐

Apothecaries Hall Co.

Iolyte LAMINATED FIBERGLASS FOR CORROSION RESISTANCE

Iolyte TANKS

Fabricated to your Specifications

●

NO MOLDS NEEDED—Made any size, any shape, at no extra cost and no loss of delivery time.

UNIFORM DIMENSIONS — NO TAPERING — Dimensions are same at bottom and top . . . means larger capacities than tapered molded tanks.

FLANGES, DAMS, Etc. — Can be inexpensively equipped with flanged connection, holes, overflow dams, baffles, separations, etc.

CHEMICALLY RESISTANT THROUGHOUT — Fabricated from **Iolyte** sheet properly reinforced. This is a structural material . . . not a lining.

Write for literature, prices, and table of chemical resistance for Iolyte tanks, crocks, ducts.

Iolyte CROCKS

Available from Stock

PRICE LIST

Gal. Cap.	Outs. Diam.	Outs. Hght.	List Cost
5	9"	18"	18.00
5	10"	15"	18.00
8	12"	16"	22.00
10	12"	20"	24.00
12	12"	24"	26.00
9	10"	24"	23.00
7	9"	24"	21.00
10	16"	12"	26.00
12	16"	14"	28.00
15	16"	18"	33.00
20	16"	24"	40.00
30	16"	36"	49.00
40	16"	48"	59.00
14	18"	12"	35.00
20	18"	18"	40.00
26	18"	24"	45.00
30	18"	28"	49.00
40	18"	36"	59.00
50	18"	48"	69.00
27	22"	18"	49.00
30	22"	20"	53.00
55	22"	36"	70.00
73	22"	48"	83.00
55	28"	22"	76.00
95	28"	36"	98.00
125	28"	48"	125.00

Iolyte DUCTS

ANY DIMENSIONS ANY CURVES ANY LENGTHS

Iolyte has greater resistance to chemical attack than stainless, Monel, or aluminum. 1/5 the weight of steel, it is superior in tension, flexural, and compression strength. Unlike thermoplastics **Iolyte** will not heat-distort below 350 deg.

Send drawings or prints for quotes and ask for literature giving chemical resistances.

Order from us or your distributor. Unless rated firm, payment with order. No COD's.

ALL PRICES F.O.B. FACTORY

SCHORI PROCESS DIVISION

FERRO-CO CORPORATION

VERNON BLVD. AT 43RD RD., LONG ISLAND CITY 1, N. Y.
FACTORY: 39-31 54TH STREET, MASPETH, L. I.

COVER STORY

Eight Per Cent of the Earth's Crust

Louis Napoleon didn't have much class as rulers go, but he did have the perspicacity to recognize the beauty and value of aluminum. He was so taken by this new metal that he had a set of cutlery made for the court. Oersted in 1821 and Wöhler in 1827 first separated aluminum as a pure metal.

Nothing much happened to aluminum until about 25 years ago. Then, it began to come into its own. In this short span of time, aluminum has become one of our most important metals.

In 1956 "the metal with a thousand faces" will appear on many of our automobiles in every conceivable metallic color and texture—red, blue, green, gold, copper, silver and even platinum.

The problem was to depict this amazing material illustratively on our cover. It was necessary to catch the unique depth of luster of the underlying metal which shines through the coloring to produce the characteristic "look" of anodized aluminum. Through a printer's trick, we managed to capture the full shimmering sheen of color and the play of lights that has come to be associated with aluminum.

Simply put, the oxide coating formed by the process is revealed by the electron microscope to be made up of tiny transparent cells, each with a center hole or pore. When aluminum is dipped in dyes or pigments, the coloring agents fill the pores. This seals the pores.

It was perhaps inevitable that the most abundant metal on earth (which forms 8 per cent of the earth's crust) should move into a position of extraordinary importance. Unlike Cu-Ni-Cr plated metals, which employ these coats for appearance and protection, aluminum is protected by a sapphire-hard coating of aluminum oxide, which is a part of the metal itself. Highly resistant to corrosion, this coating will neither chip nor peel. If scratched, clear aluminum oxide forms naturally to prevent further attack.

The wildly snaking sheet of aluminum is a piece of art most kindly loaned by the Aluminum Corporation of America. It is a part of one of their bulletins. Since it represents every finish which is applied to this fabulous metal that has come into its own, it seems to fit the situation.

Here, then, are all the elements of aluminum's beauty and usefulness: The finishes, the broad spectrum of colors, the myriad combinations that impart interest and excitment to the products made from it.

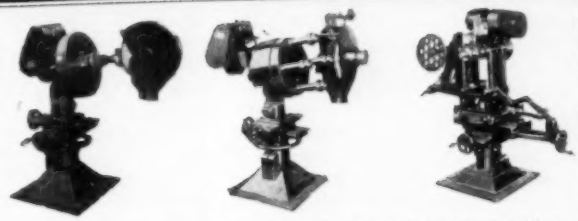
We are indebted to Alcoa both for the main article in this issue (by Vanden Berg) and a part of the cover. The rest is the product of imagination and professional proficiency.

THE EDITOR

ACME *Automatics* PUT POLISHING *and* BUFFING OPERATIONS *on a low cost production basis . . .*

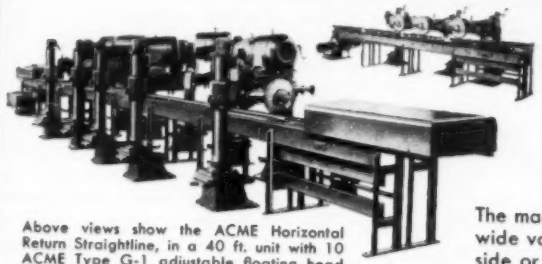
ACME *Semi-Automatics*

ACME Semi-Automatics are built to "deliver the goods." They can be fully relied upon to cut finishing costs, maintain production levels and stand up under long hours of operation!



The three ACME Semi-Automatics above are from left to right, the ACME A-2, a 2 spindle hand indexing machine for polishing and buffing cylindrical parts up to 12" diameter . . . the ACME L-4, a 4 spindle automatic indexing machine with a normal range of 250 to 400 indexes per hour . . . and the ACME D-10, an oscillating machine for finishing out of round parts. These machines are proved producers.

WRITE FOR CATALOG ILLUSTRATING WIDE RANGE OF TYPES



Above views show the ACME Horizontal Return Straightline, in a 40 ft. unit with 10 ACME Type G-1 adjustable floating head polishing and buffing lathes . . . and a 20 ft. unit with 3 ACME Type G-3 lathes.

ACME *Straight Lines*

ACME Straightlines provide effective solutions to many finishing problems. ACME progressive experience and engineering assure dependable performance at high production levels.

The machine illustrated is unusually versatile and adaptable to a wide variety of work. It may be loaded or unloaded from either side or either end. Polishing and buffing heads may be used on either or both sides and may vary in number to suit the required production and finish.

WRITE FOR OUR STRAIGHTLINE CATALOG ILLUSTRATING OTHER TYPES

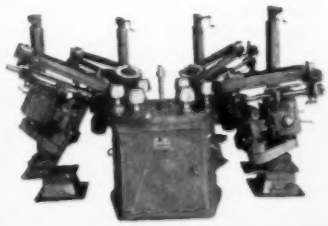
ACME *Rotary Automatics . . .*

ACME 40" Rotary with 6 station indexing table and 4 ACME Type G-1 lathes with belt arm attachment. One second indexing time . . . up to 1800 indexes per hour. Acme Indexing Rotaries are available in table sizes from 18 in. to 10 ft. diameter.

ACME 10 ft. Combination Rotary . . . for continuous operation using 24 continuously revolving spindles or for 12 station indexing operation using every other spindle. One second indexing time . . . up to 1200 indexes per hour.

ACME 50" Continuous Rotary Automatic with 40 spindles equipped with 4 Acme Type G-3 heavy duty 15 H.P. polishing and buffing lathes with inverted spindles. ACME Continuous Rotaries are available with tables up to 24 ft. diameter.

WRITE FOR ROTARY CATALOG



for POLISHING • BUFFING
GRINDING • MICRO-FINISHING
DE-BURRING • WIRE BRUSHING

SPECIAL MACHINERY — AUTOMATIC BUFFING MACHINES

ACME *Manufacturing Co.*

1400 E. 9 MILE RD., DETROIT 20 (Ferndale) MICH.

Builders OF AUTOMATIC POLISHING AND BUFFING MACHINES FOR NEARLY HALF A CENTURY

MAIL BOX–

DEAR SIR:

We have had our attention drawn to the announcement on page 863 of your July issue (item E-730) describing the Riedel Barrel Chrome Plater. Whereas this is believed to be the first to point out that a Canning Automatic Chrome Plating Barrel has been operated by a well-known firm of medical and surgical instrument makers in New Jersey since Spetember 1954. We are also pleased to state that the quality of the plated parts meets the firm's high standards of requirements and that the quantity of articles produced per hour is in accordance with the output claimed. Yours faithfully,

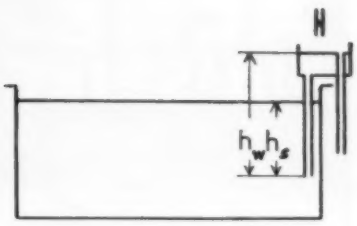
A. F. Brockington
W. Canning & Co. Ltd.
Birmingham, England

Solution Level Control

DEAR SIRS:

The paper by J. W. Holland *et al* on "Some Aspects of Solution Level Control" in the November 1955, issue reminded me of a neat device for that purpose, which I saw in a plant in England a short time ago. It depends for its operation on the difference in specific gravity of the solution in question and water and requires neither valves nor electrical devices. In addition it is fully automatic. The principle is shown in the accompanying figure.

The device consists of a box open at the top. It has one pipe leading from the bottom of the box into the solution, the level of which is to be controlled, and one overflow pipe, which may lead to the floor or into an adjacent rinse tank. Above the box is placed a faucet, from which water drops or runs at a rate higher than the rate of evaporation of the solution. The box is kept at such a height above the



solution that the pressure of water equals the pressure of solution at the bottom of the first mentioned pipe. If the specific gravity of the solution is a (water = 1) and the heights as shown in the figure, this equilibrium is reached when $h_s \cdot a = h_w$. The depth h_s is preferably adjusted so that the water enters near the bottom of the tank, which promotes good mixing. Thus if the solution is 30 in deep, h_s may be 24 in. If $a = 1.25$, h_w becomes $1.25 \times 24 = 30$ in.

As the solution level drops, h_s is reduced while h_w remains constant. For argument's sake, make the reduction 1 in, i.e. $h_s = 23$ in. The ratio h_w/h_s is now $30/23 = 1.30$, whereas a has risen a smaller amount on account of the evaporation, about 1.26. Water then flows into the solution to restore the hydrostatic balance.

Actually the evaporation is continuous and the flow of water continuous. Because diffusion is very much slower than the flow, there is no mixing of solution and water in the pipe.

The box and the pipe should be made of a material that resists the solution and does not contaminate it, suitably of a plastic.

K. Gustaf Soderberg
Saevedalen, Sweden

[Mr. Soderberg was assistant editor of PLATING *from June 1945 to July 1946 and editor from August 1946 to May 1952. It is a distinct pleasure to have this letter from him—Ed.]*

PLATING'S Getting Better

DEAR SIRS:

I recently had occasion to refer back to previous issues of PLATING for some needed information. I could not help being forcefully impressed with the tremendous improvement which has taken place in our official publication in recent months.

You and the other boys deserve much commendation for the job you are doing.

Wishing you a Happy New Year,

Charles C. Conley
Houdaille Industries, Inc.

SEE FOR YOURSELF

The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont.

Please give me details on how I can get a test supply of "Plus-4" anodes sufficient to fill one tank.

NAME.....

COMPANY.....

ADDRESS.....

CITY.....ZONE....STATE.....

How you can cut copper costs with

"PLUS-4" ANODES

(Phosphorized Copper)

You can stop throwing copper away in acid solution dumped to correct solution concentration. You can also reduce acid you have to add—another cost saving. And there's no copper wasted as sludge at the bottom of the tank.

Because anodes corrode uniformly, you can get more cathode deposit per anode. Smaller "fish" mean lower scrap loss.

Smooth, heavy cathode deposits—without diaphragms or "bagging"—mean better work.

Find out for yourself—as other electrotypers have—how easy it is to cut your acid plating costs with "Plus-4" Anodes. 56137

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More on The Nickel Story

DEAR SIRS:

Mr. Palik in his Detroit Branch talk stated that an average of 4 pounds of nickel goes into plating on the average passenger car and calculates the size of the "gray market," as he describes it, on that basis.

According to the information which I have been able to gather, there is approximately 4 to 4½ pounds of nickel consumed in a motor vehicle. This includes both passenger cars and trucks. This nickel is not confined, however, to plating uses but also covers nickel for such applications as 3½ per cent nickel alloys used in truck shafting and in valves. In my opinion a figure of 2 pounds per car for plating purposes would be more nearly correct. I believe the average bumper uses between ½ and ¾ pounds of nickel and that approximately 60 per cent of the plating area on passenger automobiles goes on the bumper. Consumption statistics of nickel consumed in plating would seem to corroborate these figures.

It is further stated that the steel industry has had sufficient nickel to meet its more optimistic requirements for processing stainless steel.

This is not the case. The stainless steel industry originally estimated its 1955 demand at 85 million pounds for stainless steel. Actually the industry will consume about 53 million pounds for stainless steel, including a substantial quantity for defense work. Availability of stainless steel will fall far short of industrial demands for this product.

Mr. Palik insists that the Government should probe into the real reason behind the "gray market."

As I stated in previous communications with Mr. Palik and again in my comments in Detroit, the Government encourages and solicits the cooperation of nickel consumers in identifying and uncovering sources of nickel offered at premium prices.

The Business and Defense Services Administration investigates each case reported in order to determine the source of such nickel. If it is nickel originally acquired from normal sources of supply, that is other than nickel originating from scrap or imported from France, West Germany and Japan, the BDSA notifies the supplier so that action can be taken to shut off supplies.

In any case where nickel was originally obtained by use of defense ratings and the investigation reveals misuse of the rating, action can be taken under the criminal penalty provision of the Defense Production Act.

Sincerely yours,
Herman B. Director
Staff Advisor
Industrial Raw Materials
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BOOKS

Chromium Plating by Morisset, Oswald, Draper and Pinner. (Robert Draper, Ltd.), 854 pp., 222 illustrations. $11.00 nonmembers, $9.50 members.

Reviewed by A. W. Logozzo, Nutmeg Chrome Corp., W. Hartford, Conn.

This book contains more data on chromium plating than any published heretofore. The authors evidently devoted considerable time in collecting and corroborating much of this information to make it a valuable addition to any library as well as any plater's reference book collection.

In attempting to cover everything thoroughly the authors had a tendency to jump all over the lot instead of covering ground orderly and progressively. They devoted some twelve pages to listing hard chrome applications and I couldn't help but feel this decidedly unnecessary. The advertisements in the rear of the book certainly detract from its value as the ultimate in chromium plating information.

Many of the chapters under hard chrome applications start off listing physical properties and their advantages for the items in the particular chapter. Chapters 40, 41 and 42 extol the virtues of hard chrome, and chapters 43, 44, 45, 46, 47 and 48 again list the physical properties and the advantages for each item. It would seem like much repetitive listing of these few virtues which should have been digested by the time chapter 27 is studied.

In the decorative section much concern is expressed over trivalent chrome. This is highly impractical in decorative plating and not apt to be encountered because of the larger anode areas in relation to the cathode surfaces.

There are also claims of poor corrosion resistance when light films of chrome are used over brass and nickel silver. This is true as far as brass is concerned because of dezincification. The chrome over nickel silver has proved to be an excellent corrosion resistance medium in actual practice and it would seem that the statements were made without actual corrosion studies.

In general, the many tables taken from the literature will afford excellent reference material. The chapter on solutions should interest and amaze the plater who so often dreams of developing the perfect chrome bath when he sees many of his ideas already tried. These solution formulations will also tend to dispel the secrecy attendant with certain "proprietary" processes that are guaranteed not chrome but certain alloys harder than chrome and applied behind curtains; the curtain, of course, to prevent the chrome solution from being identified with the "secret" low-temperature alloying process.

Despite some of the criticisms listed previously, this book is a compendium of most of the literature written and is endorsed for platers, industrial engineers, etc., and anybody interested in chromium plating as it exists at this time. The authors are to be complimented for their courage in tackling such a mountainous task and presenting the most complete book on this subject up to this date.

Statistical Abstract of the United States, 1955. Compiled and edited by the Bureau of Census, 77 agencies of the Government and 53 private firms. 1,064 pp., 1,166 tables, 55 charts. $3.50 (in buckram).

This compactly assembled, convenient reference book has been published annually since 1878. It is the standard summary of statistics on industrial, social, political and economic organization of the United States.

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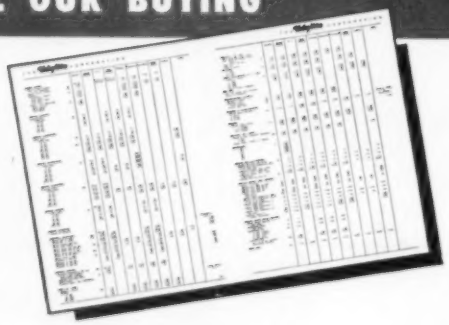

This statement by Phil A. Young, General Manager, Midwest Plating & Chemical Company, Kokomo and Logansport, Indiana, is typical of many busy executives throughout the country.

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WORLD'S LARGEST PLATING SUPPLIER

(Advertisement)

A NEW HEAVY-DUTY PLATING BARREL

The Udylite Corporation recently announced a new heavy-duty plating barrel, with increased cylinder sizes.

The new barrel has a cylinder made of cemented Tempron hard rubber construction and is furnished in sizes of 16″ by 36″ and 16″ x 30″. These are inside dimensions of the barrel.

Udylite engineers selected Tempron hard rubber for the cylinders as it withstands even under load, the highest temperatures used in plating—it has a chemical resistance to a wide variety of corrosive solutions—great resistance to abrasion —strength to handle heavy loads and performs satisfactorily through the complete cycle of operations.

Ruggedly constructed, the cylinder has heads of 1⅛″ thickness, the regular panels are ⅝″ thick, door panels ¾″ thick and rails 2¼″ square. Superstructure construction follows long accepted Udylite design. Heavy-duty cast-brass contact saddles are machined for perfect contact with cathode horns. Self-locking feature prevents barrel cylinder from rocking. The plating barrel is designed so that the cylinder hangs low—to submerge its top completely. This results in greater current capacity and faster plating. The dangler contacts are the only exposed metal surfaces beneath the solution.

The new Udylite Plating Barrel will handle loads up to four hundred pounds and will plate surface areas up to one hundred square feet, depending upon the shape and size of the work to be plated. As the barrel will draw up to 1500 amperes at 18 volts, tanks are bussed for 1500 amperes. Solution working capacity is 430 gallons.

While the standard specifications of the new barrel plater are for cyanide plating cycles, it is also available for all normal alkaline and acid plating solutions. Where the new plater is to be used for acid plating, Koroseal-lined tanks are usually furnished, although, other linings are also available.

Two barrel rotating speeds are furnished —4 and 8 RPM and the cylinders are individually driven by a ¾ H.P. Motor.

Special conforming anode containers are supplied with each plating barrel and these anode containers are anodically charged at both top and bottom for better current distribution.

According to Udylite engineers, this new high production barrel is capable of increasing production per man hour from 50 to 100 per cent over barrels of the present standard sizes.

(Advertisement)

NEW FILTERS

Recently introduced by the Udylite Corporation, a new line of filters answers the demands of the plating industry for fast filtering, low cost, portability with maximum simplicity of design.

One of the features of the new filters is a self-priming pump which saves time and adjustment in getting the filter into operation. A flip of the switch puts the machine to work.

These new Udylite-Detroit Filters also feature a stainless steel pump with a neoprene impeller and a lip seal which can be changed without dismantling the entire machine.

For high chloride solutions, Udylite-Detroit Filters are furnished with plastisol lined pumps and filter drums.

By the simple expedient of reversing the motor of the filter pump, complete back washing can be obtained. This method uses no air and eliminates the necessity of other equipment.

Fresh water can then be pumped through the filter by attaching the outlet hose to a tank of fresh water. After flushing the filter, the waste is carried through the regular inlet hose to a sewer.

With this method of back washing, the machines can be recaked many times before the filter has to be opened for thorough cleaning.

The simplicity of the filters enables them to be back washed in a matter of minutes and returned to operation. The filter plates can be taken out by the removal of one nut.

Still another salient feature of these filters is the hollow, perforated, stainless steel filter plate in the filter drum, which permits the flow of a greater volume of solution per hour, with a low co-efficient of friction.

The cake does not drop in Udylite-Detroit Filters when the machine is stopped. By use of this new type stainless steel filter plate, filtering is accomplished at high speed.

The portability of the filters enables them to be quickly placed next to solution tanks in any section of the plant without use of dollies or lift trucks.

Their compactness requires little floor space and yet they process three to four times as much solution as other filters of comparable size.

In addition to the low initial cost of Udylite-Detroit Filters, additional savings are realized in low cost and speed of operation. They give more filtered gallonage per dollar of initial cost and cost of operation.

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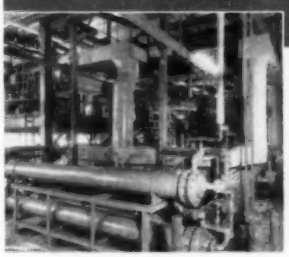
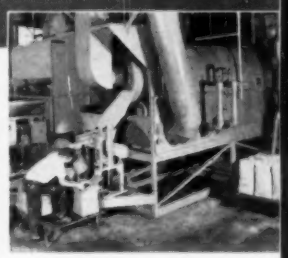
PLATING 400,000 POUNDS A DAY WITH THIS **UDYLITE** MACHINE . . .



End view showing exhaust system and heat exchangers.

Unloading station of Udylite Automatic Barrel Machine.



Drum type dryer used for drying bright zinc plated work.

Harding Manufacturing Company are bright zinc plating 20,000 pounds of small parts per hour with their Udylite Full Automatic Barrel Plater and are running it 20 hours a day.

Only four men are used in operating this Udylite machine. One man loads the feeder hopper. One man loads the cylinders. One man unloads the cylinders and one man unloads the dryer and dichromating operation—*5,000 pounds of plating per man hour.*

And with this tremendous production is all the desired versatility. The machine is so designed with electrical controls that the plating time and thickness of plating in each cylinder load can differ from other loads going through the machine cycle at the same time. The plating time for each load is predetermined by the operator at the time the cylinder is loaded.

This is another example of Udylite experience in production plating. If you have a plating problem—large or small—it will pay you to consult Udylite.

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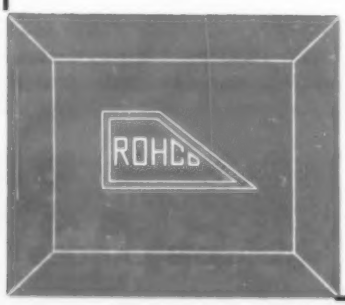

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PROPOSED SUBSTITUTES FOR NICKEL PLATING

by Dr. A. Kenneth Graham*

The data on proposed substitutes for nickel plating given in the following tables have been compiled from a questionnaire which was sent to the companies and individuals listed as collaborators.[1]

They were distributed as part of a paper[2] presented on December 2, 1955 at the Annual Technical Session of the Detroit Branch of the American Electroplaters' Society.

The reader's attention is especially directed to the footnotes to Table I in which a distinction is made between years of service life as reported by users of the substitute coatings and by non-users or vendors. The latter tend to be more optimistic in certain cases and more performance data will be required to reconcile the two. A further distinction is made with respect to the experimental evaluation of specific substitutes as compared with production experience.

The data are specifically for coatings on ferrous base metals. No useful purpose can be served by discussing them in detail. The proposed substitutes in general are more suitable for indoor service, although such conditions have never been defined for test purposes with respect to the wide variations which may apply, and performance data must therefore be interpreted with reservations. Salt spray and humidity test data only indicate the continuity of coatings and the type of corrosion products which may form under these test conditions. They can not be correlated with respect to service life.

Our information on outdoor performance of plated coating combinations is much more complete, especially with respect to copper and/or nickel-chromium coatings, although salt spray and humidity test data are similarly limited. The suggested substitute coatings, other than a heavy buffed copper-substandard nickel-chromium combination, are wholly inadequate as substitutes for nickel-chromium in *severe* outdoor service. Substitution of a copper-tin alloy for copper in a combination coating using a thin nickel deposit and chromium has value, according to the British (CODAF)† report,[3] but does not materially change the above conclusion with respect to severe conditions, and the wide fluctuation in the cost and supply of tin is a matter of record. The British also reported that "none of the antimony deposits from known solutions were sufficiently ductile and adherent to promise commercial application."

Crack-free chromium has not been mentioned, chiefly because at the thicknesses required it is not considered comparable as a decorative-protective coating for conventional copper-nickel-chromium coatings.

---

*Electroplating Consultant and President of Graham, Crowley and Associates Inc.

†Twenty-four inquiries were mailed, to which thirteen replies containing data were received. The author wishes to thank the collaborators for their cooperation.

[2]See Plating, Vol. 43, No 1 page 91-106, (1956).

[3]Report on an outdoor evaluation program of alternate finishes. Electroplating and Metal Finishing, **8**, 9 (1955).

†Cooperative Development of Alternate Finishes Group formed by a number of the larger manufacturing companies interested in electroplating.

Table 1

Substitute Bright Chrome Coatings for Ni-Cr Over Ferrous Basis Metals
(Final Chromium — 0.01 mil)

Pertinent Data	A	B	C	D	E	F	G	H
	Cu-Ni-Cr	Cu-Cr	(Cu + Sn)-Ni-Cr	(Cu + Su)-Cr	Cr	Pb-Sb-Cr	W. Br-Cr	Cu-W. Br-Cr
1. Is organic coating necessary?[1]	N	Y	N	Y	N, P	N	Y, N	N, P
2. Coating corrosion product in outdoor service	CS	CS	CS	CS	R	?	WR	WR
3. a—Outdoor applications[2]	B, G, T, H	B, G, T, H	All[2, *]	All[2, *]	T, (G)[2]	(T, B)[2]		(B, G)[2, 3]
b—Relative cost to Ni	S	M	M	?	M	M	S, M	S, M
c—Required thickness, mils.								
Cu	0.7–1.5	0.5–1.						0.3–1.5
Cu-Sn			1.–1.5	1–1.5				
Pb						0.2		
Sb						1–1.5		
WB							0.3	0.2–1.5
Ni	0.6–0.5		0.2–0.5					0.2–0
d—Service life, yr	1.–2. (2–3)*	0.1–.2 (0.5–1.)*	1.5 (2–3)*	0.6 (2–3)*	0.1–0.5	0.5–2.0	0.1–0.2	0.1–0.6
e—Life with organic coating, yr		0.16–.5		1.0	0.16			
4. a—Indoor applications	*H*, *T*, A	*H*, *T*, A	(H, T, A)*	(H, T, A)*	—	—	—	A, F, *H*, L, *T*
b—Relative cost to Ni	L, *S*, M	*L*, S, M	L, S, M	S		L, S	S	L, *S*, M
c—Service life, yr	>2	>2	>8*	>8*				>2–(5)*
d—Life with organic coating, yr	>2	2						>2
e—Required thickness, mils								
Cu	0.4	0.5						0.1–0.2
Cu-Sn			0.3–0.5	0.5				
Pb					0.2			
Sb					0.5			
WB								0.2–(2.5)*
Ni	0.5		0.2					(0.2)[3]
5. Properties:[4]								
a—Hardness	M, *H*	*S*, M	M, *H*	*M*, H	H, *VH*	S	*M*, H	M, H
b—Brittle	N	N	N	N	Y	Y	Y	*Y*, N*
c—Ductility	P, *F*	F, *G*	F	F	P	P	P	P, *F* (M, G,)*
d—Internal stress	L, M, *H*	L	*L*, M	L	H	M	M, *H*	*M*, H
e—Limited thickness							Y	Y
6. Relative rating** to ASTM Ni-Cr Specifications:								
a—Outdoor service	4–5	1–2	4	3	1–2	3–4	1–2	3
b—Indoor service	5	4	5	5	3	3–4	3	5

Notes: [1]—Type organic (acrylic, melamine, alkyd).
[2]—Experimental.
*—Data from non-user.
**—Rating relative to Ni-Cr = 100% = 5; 80% = 4; 60% = 3; 40% = 2; 20% = 1.
[3]—Not recommended for outdoor use by supplier of low-copper white brass process.
[4]—Vary with conditions; italic rating is average.

Table II

Abbreviations for Answering Questions Re Properties in Table I

Property No.	Suggested Abbreviations
1	(a) Y—yes; N—no; P—if preferred (b) Name type
2	CS—for copper stain; WR—for white rust; R—rust
3	(a) B—bumpers; G—guards; T—trim; H—hardware (b) Example: 0.5 Cu 0.2 Cr (c) S—same; M—more; L—less (d) Examples: 6 mo; 1.5 yr (e) Example: 1.5 yr
4	(a) F—furniture; H—hardware; L—lamps, fixtures, etc.; T—trim; A—appliances (b) Example: 0.5 + Sn 0.2 Cr (c) S—same; M—more; L—less (d) Examples: 6 mo; 1.5 yr (e) Example: 1.5 yr
5	(a) S—soft; M—medium; H—hard; VH—very hard (b) Y—yes; N—no (c) P—poor; F—fair; G—good (d) P—poor; F—fair; G—good; E—excellent (e) L—low; M—moderate; H—high (f) Example: 0.25
6	Rating relative to Ni–Cr = 100% = 5; 80% = 4; 60% = 3; 40% = 2; 20% = 1

Table III

Summary of Experience Using Substitute Finishes for Nickel-Chromium

Usual Environment for Application

	Outdoor (Severe)		Indoor (Mild)	
	Coatings*	Service Life, yr	Coatings*	Service Life, yr
1. *Automotive:*				
(a) Bumpers and guards	A (1.0–0.5–.01)	0.5		
	A (1.5–0.5–.01)	2.		
	A	2–3**		
	B	0.5–1**		
	C	2–3**		
	D (1.5–.01)	0.5–1.0†		
	D	2–3**		
	F (0.2–0.2–1.5–0.01)	0.5†		
	G (0.3–0.01)	0.25†		
	H (0.5–1.0–0.01)	0.25†		
(b) Hardware	BO	.16	B (0.5–0.01)	>2
(c) Trim	A (1.0–0.5–0.01)	.5	B (0.5–0.01)	>2
	BO (1.0–0.01–0.75)	.16	G	4**
2. *Hardware:* Builders and cabinet			B	>3**
			D	>8**
			G	>4**
3. *Metal Furniture*			A, G, H	>4**
4. *Household appliances*			B (0.7–0.01)	>5
			A, H, G	>4**

*If coating includes organic film, letter "O" is added after letter designation—for example: BO.

**Data from a non-user.

†Experimental.

Typical Comments from Collaborators

(1) "Field tryouts were made with bright chromium over buffed speculum (55% Cu–45% Sn) 0.7 mil thick and were not satisfactory. After six months (indoors) these cabinets looked like new. After one and one-half years service some copper corrosion products and rust appeared and after two years service considerable rust and customer dissatisfaction developed."

(2) A coating comprising (0.3–0.8 mil) copper—(0.01 mil) chromium and (0.4–1.0 mil) clear organic . . . "proved satisfactory on outdoor exposure until clear synthetic enamel film failed. Then the piece, in addition to presenting an unsatisfactory appearance because of unsatisfactory condition of the synthetic enamel, tended to turn a reddish brown color and/or rust because of copper and/or basis metal corrosion."
"Synthetic enamel failure, which in any case seemed to occur within one to two years, might occur sooner, depending upon the care with which the chromium plated surface was prepared to receive the organic film."

(3) "Copper-chromium plated interior (car) parts . . . are still satisfactory after two years service."
"White brass-chromium plating . . . on certain interior steel (car) parts . . . as far as we know, . . . are still satisfactory."

(4) "A very considerable effort was made to use lead-antimony-chromium sequence with and without an undercoat of copper. . . . Experimental pieces for the most part failed within a few months in the Detroit area (outdoor service) due to the appearance of black spots and obvious cracks in the deposits."

(5) "It is our experience that no clear lacquer or baked enamel is satisfactory for outdoor exposure. . . . The life of these coatings may be only a few days, and not more than six months. Such coatings flake and/or peel within this period and become very unsightly."

(6) "At the present time we are . . . paying a terrific premium for a considerable portion of the nickel which we are using."

(7) "We have no nearly satisfactory substitute for nickel-chromium coatings for outdoor exposure, and very few partially satisfactory for indoor use."

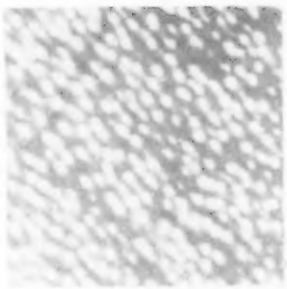
(8) "Bronze-chromium is no better than copper-chromium. Bronze-nickel is somewhat better than copper-nickel. Antimony, . . . some very good and some very bad service results."

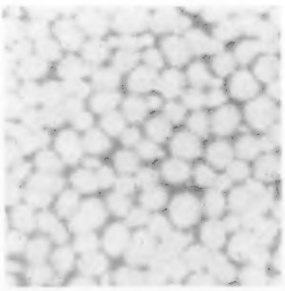
COLLABORATORS

Company	*Individual*
Battelle Memorial Institute	Dr. Charles L. Faust
Chrysler Corporation	Donald M. Bigge
Doehler-Jarvis Division, National Lead Company	Lyman B. Sperry
E. I. duPont De Nemours and Company	Dr. H. L. Benner
Ford Motor Company	Henry Kafarski
General Motors Corporation	C. F. Nixon
Hanson-Van Winkle-Munning Company	M. B. Diggin
The Harshaw Chemical Company	A. H. DuRose
Houdaille-Hershey Corporation	W. L. Pinner
The National Cash Register Company	Walter E. Moline
Promat Division, Poor and Company	Harold A. Kahler
Sunbeam Corporation	B. C. Case
The Udylite Corporation	Dr. R. B. Saltonstall

The questionnaire was sent to 24 individuals, all of whom replied. However, only 13 had data available.

COMMERCIAL
ANODIC SURFACE TREATMENTS FOR ALUMINUM AND ITS ALLOYS





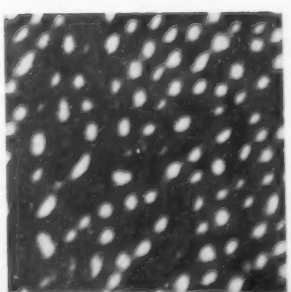
R. V. Vanden Berg†

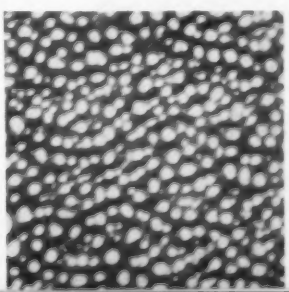
Aluminum is a versatile metal in respect to surface treatments. It responds to a wide variety of such basic treatments as anodic oxidation, electrobrightening, electroplating, chemical oxidation, chemical phosphating, chemical immersion and etching to produce many types of films, coatings or surface effects for various commercial applicaitons. Some of the most important commercial finishes are produced by anodic type electrochemical treatments. In this category are the anodic oxidation and electrobrightening processes. Anodic etches are also included but at present are not as important from the commercial standpoint.

Historical

It is a well known fact that a thin oxide film forms on aluminum when exposed to the atmosphere. This thin, tenacious film provided excellent resistance to corrosion. The pleasing natural appearance of the metal, in conjunction with its high resistance to corrosion and light weight, accounts for its importance as a modern material of construction. This ability of aluminum to form adherent oxide films led to the development of electrochemical processes to produce thicker and more effective coatings from the standpoint of protection and decoration. These electrochemical processes are known commercially as anodic oxidation, anodic treatment or anodizing. It is generally recognized that H. Buff[1] in 1857 discovered the behavior of aluminum when made anode in sulfuric acid solutions. After these initial observations, many others concerned themselves with the interesting rectifying effect and other electrical properties of coatings formed under various conditions. The result of these workers' efforts was of important scientific interest and laid the foundations for later practical applications.

† Alcoa Process Dev. Labs. Aluminum Co. of America, New Kensington, Pa.





In 1904 W. R. Mott[2] described several anodic processes utilizing a variety of electrolytes. It is important to note that Mott not only proposed a theory for the formation of anodic coatings but also discovered the high absorptive characteristics of these coatings. He also proposed the use of these anodic films for protection against corrosion and for electrical insulation. These dates would seem to mark the recognition of the tremendous industrial potential of anodic coatings on aluminum alloys. In the early 1900's[3,4] patents began to appear describing the anodic treatment of aluminum in various electrolytes for the formation of films for capacitors and rectifiers.

Anodic coatings can be formed on aluminum in a wide variety of electrolytes utilizing either ac or dc current or combinations of both. During the 1920's and early 1930's considerable progress was made in the development of anodic oxidation processes by workers in the United States, Great Britain and Japan which led to their commercial use.[5-8] Electrolytes of sulfuric, oxalic, and chromic acids are considered to be the most important commercially. Other electrolytes which include borates, citrates, chromates, bisulfates, phosphates and carbonates are used for specialized applications.

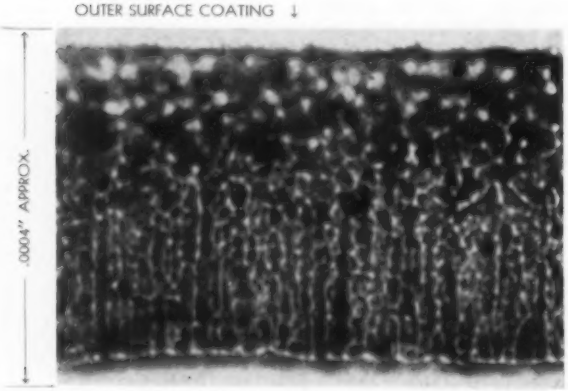


Fig. 1. Photomicrograph 1000X showing section through anodic oxide coating illustrates pore structure. Interface is at bottom; spongelike structure is at top and represents outside surface of anodic coating

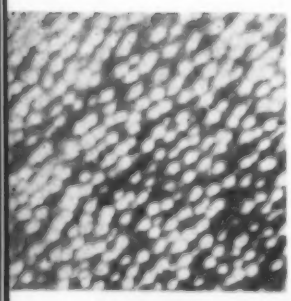
Formation of the Oxide Coating

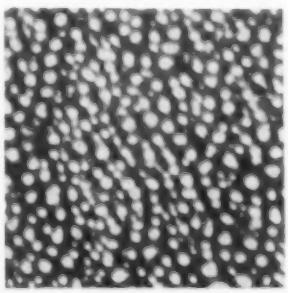
The theory of anodic oxide formation on aluminum is rather complex and is beyond the scope of this article. In general, the coating formed is considered to be essentially aluminum oxide. It is formed by reaction of the aluminum with electrolyte when the aluminum is made anode. Oxygen is liberated at the surface of the aluminum and oxidation of the surface takes place.[9] As the reaction progresses, the oxide coating grows into the metal. The last formed oxide is an extremely thin, nonporous layer at the interface and is generally known as the barrier layer. The thickness of the barrier layer is dependent upon the formation voltage and the type of electrolyte. Although this layer is very thin compared to the total thickness of the anodic coating, it has a significant effect on the resistance to corrosion and electrical properties of the coating.[10]

The first formed oxide layer is located at the extreme outer surface of the coating. In general, it is relatively porous as compared to the rest of the coating, since it has been in contact with the electrolyte from the beginning and the solvent action of the electrolyte has produced a spongy outer structure. The type of electrolyte and its temperature and the duration of the treatment determine the amount of solvent action. The porosity of the anodic coating located between the barrier layer and the outer surface of the coating is one of its outstanding features. These pores have definite size and number depending upon the formation voltage, electrolyte and other processing details. There are billions of pores per square inch, consequently, their diameter is very small. The photomicrograph of Fig. 1 illustrates the porosity characteristics.

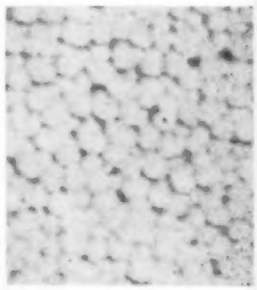
The weight of anodic coating per unit area formed is another important consideration, and it is dependent upon the thickness and porosity of the coating. The overall thickness of an anodic coating is generally determined by the total ampere minutes of current used during the anodic oxidation cycle. Latest information indicates that anodic coatings have a definite cellular structure, and the size of the cell is determined by the type of electrolyte and the formation voltage.[11] The electron micrograph shown in Fig. 2 shows the cell structure and pore size for different voltages in a phosphoric acid electrolyte.

Fig. 2. Electron micrograph (perpendicular to surface) 35000X (oxide film replicas) showing cell (left) and pore (right) structure of coating formed in 4 per cent phosphoric acid electrolyte


20 Volt Cell


30 Volt Cell

20 Volt Pore


30 Volt Pore

By selecting the proper combination of electrolyte and operating conditions, anodic coatings can be formed with definite predetermined characteristics. These anodic coatings may be thin and dense or thick and porous. The degree of porosity determines the absorption characteristics of the coatings. Porosity also affects the resistance to abrasion. Coatings with a smaller number of small diameter pores will have high resistance to abrasion because the coating is dense and will support higher loads.

Since the cell and pore size of anodic coatings can be varied by changing processing details, these characteristics may be utilized to produce effects which are commercially important. F. B. Flick[12] of the Aluminum Research Laboratories discovered that coloring substances such as organic dyestuffs could be used to produce a wide variety of decorative effects. The coating can also be impregnated with pigments for color or chromates or silicates for increased resistance to corrosion. Light sensitive materials also can be incorporated in the coating so that photographs can be reproduced by a process which is similar to conventional methods employed on glass photographic plates.[13, 14]

Thereafter, treatments commercially known as sealing must be used for most anodic coatings. These sealing processes render the coatings nonadsorptive as they close the pores. This sealing generally takes the form of immersion in hot water or in some cases wet steam. It is generally recognized that the oxide lining of the pore wall is converted from the amphorous to the mono-hydrate state with subsequent increase in volume. This increase in volume closes the pore and makes the original absorptive coating impermeable and resistant to staining and also increases its protective action against corrosion of the underlying metal. Other sealants may also be used. These include water solutions of chromates, silicates, phosphates. Oil, wax or graphite impregnation may also be used for certain specialized applications. Since the organic dyestuffs used to color anodic coatings are soluble in water, the conventional hot water sealing method cannot always be used because of leaching of some colorants from the coating by hot water. Sealants for anodic coatings colored by organic dyestuffs are usually acetates of nickel or cobalt. The colloidal hydroxides produced by hydrolysis of the hot solution precipitate and seal the pores.

Types of Electrolyte

Previous discussion has mentioned the variations in structure from the metal interface to the outer surface of the oxide coating; however, it might be desirable to briefly summarize the important points. The presence of extremely small diameter pores oriented perpendicular to the metal interface determine the characteristics of the coatings. The characteristics of the pores are determined to a large degree by the type of electrolyte. The diameter of the pores is large enough so that the electrolyte penetrtaes and carries the current necessary for the oxidation reaction to take place. Most of the electrolytes used have appreciable solvent action on the oxide coating formed. This solvent action increases the original pore diameter. Variations in operating conditions with a specific electrolyte will also produce oxide coatings with different degrees of porosity. For instance, raising the electrolyte temperature will increase the porosity.

The common electrolytes used at the present for commercial production include sulfuric acid, chromic acid, oxalic acid, boric acid and mixtures of sulfuric and oxalic acids. Other specialized electrolytes include phosphoric acid, sulfuric acid and oxalic acid solutions containing salts of titanium, zirconium and thorium. Of those mentioned, probably the most widely used is the anodic oxidation process utilizing a sulfuric acid electrolyte with direct current based upon English patent by Gower and O'Brien.[15] The large scale industrial development of this process took place in the United States. Numerous variations of this anodic process were developed to produce anodic coatings for a wide range of commercial applications. Anodic coatings produced in sulfuric acid electrolyte are generally translucent, and a wide range of properties may be obtained by variations in operating techniques. By comparison with oxide coatings produced in other electrolytes, they have a greater number of pores which are smaller in diameter. The Alumilite* processes are operated in accordance with specific conditions to produce coatings satisfactory for many commercial applications.

Anodic oxidation in a chromic acid electrolyte using direct current was first established in England by Bengaugh and Stuart[16] and was used commercially to provide coatings for increased resistance to corrosion. Further developments in the United States have been made which extend the usefulness of coatings made in chromic acid electrolyte. Modifications of the chromic acid by sulfuric acid additions have been described; however, they have not been used commercially. The coatings obtained by the chromic acid process are much thinner than those produced by the sulfuric acid process based upon the same time of anodic oxidation. The tables of Fig. 3 show typical coating thicknesses and weights for different alloys anodized in sulfuric or chromic acid electrolytes. Higher formation voltages are required than for the sulfuric acid process. In addition to being thinner than sulfuric acid anodic coatings, the oxide coatings produced in a chromic acid electrolyte have a different structure. In general, there are fewer pores but they are larger in diameter than those in coatings formed in a sulfuric acid electrolyte. Although the coatings are thin, they provide high resistance to corrosion, because of the presence of chromium compounds in combination with their relatively thick barrier layer. Since the conventional anodic coatings produced in a chromic acid electrolyte are thin, they have low resistance to abrasion but a high degree of flexibility. The anodic coatings produced in a chromic acid electrolyte have an opaque, slightly irridescent appearance and generally are not colored with organic dyestuffs such as the anodic coatings produced in sulfuric acid electrolytes.

The chromic acid anodic process is critical with respect to alloy composition. In general, the process is not rec-

* Trade name of the Aluminum Company of America which has established a wide variety of commercial treatments known as alumilite treatments.

Table I

Typical Weights of Oxide Coatings Formed in a Sulfuric Acid Electrolyte Wrought and Cast Alloys

Conditions—15% H_2SO_4 Electrolyte—70°F.
20 min. @12 a/ft.²

Alloy	Former Designation	Thickness (Inches)	Weight (mg/in.²)
7075-T6	75S-T6	.00022	8.73
6061-T6	61S-T6	.00024	10.2
2024-T4	24S-T6	.00020	6.65
5052	52S-O	.00024	10.3
3003	3S-O	.00025	10.1
1100	2S-O	.00023	10.3
195-T6		.00020	7.8
356-T6		.00025	10.2
214		.00025	12.0

Table II

Typical Weights of Oxide Coatings Formed in a Chromic Acid Electrolyte Wrought and Cast Alloys

Condit'ons—10% CrO_3 Electrolyte 95°F.
60 min. @40 V

Alloy	Former Designation	Thickness (Inches)	Weight (mg/in.²)
7075-T6	75S-T6	.00011	3.3
6061-T6	61S-T6	.00013	6.0
2024-T6	24S-T6	.00010	3.0
5052	52S-O	.00011	5.7
3003	3S-O	.00011	5.7
1100	2S-O	.00012	5.9

Fig. 3. Tables comparing weights of anodic coatings formed in sulfuric acid electrolyte with those formed in chromic acid electrolyte

ommended for aluminum alloys containing more than 7 per cent silicon or 4.5 per cent copper. Alloys containing over 7 per cent total alloying elements are also not recommended. It is difficult to form films on these alloys, particularly on casting alloys. Anodic solution (surface attack) will generally occur unless the processing conditions are controlled very carefully.

On most aluminum alloys, anodic coatings of this type do not require sealing. However, sealing in a boiling dichromate or a dilute chromic acid solution produces coatings with the best resistance to salt spray corrosion on 2014-T6 and 7075-T6 alloys.

Anodic oxidation in oxalic acid solutions produces coatings which are essentially transparent. The color varies from a light yellow to bronze. Such coatings are dense with little absorptive capacity but possess high resistance to abrasion. Oxalic acid processes were first developed in Japan by Kujirai and Veki.[18] They have been used extensively in Germany and are commonly referred to as Eloxal GX or GXh if formed with dc current and Eloxal WX or Eloxal WGX if formed with ac-dc.[19] As mentioned previously, combination electrolytes of sulfuric and oxalic acids are sometimes used.[20] Such combinations produce effects somewhat similar to lowering the temperature of the sulfuric acid electrolyte, i.e., a denser coating with greater resistance to abrasion is the result.

The Ematal process developed by M. Schenk[21] in Switzerland utilizes oxalic acid in combination with titanium, zirconium and thorium salts for the electrolyte. Oxide coatings produced by this anodic oxidation treatment are dense and have an opaque, light gray appearance. Since the composition of the electrolyte is quite complex, difficulties may be encountered on a production basis.

The anodic oxidation of aluminum in sulfamic acid was developed in Italy by R. Piontelli.[22] The coatings produced by this method are considered to be denser than those produced by the sulfuric acid process. This anodic process is expensive owing to the high cost of sulfamic acid.

Anodic coatings produced in a phosphoric acid electrolyte are not considered commercially important. At one time they were used for preparation of aluminum surfaces prior to electroplating. Oxide coatings formed on aluminum in a phosphoric acid electrolyte using direct current have large cells and a large pore diameter.

Alternating current may be used to form anodic coatings on aluminum and its alloys with all of the electrolytes previously mentioned but the aluminum surface is anodic only half of the cycle so that an oxide coating is formed only at half the rate of coatings formed with direct current.

Effect of Alloy Composition

The previous discussion relative to the anodic oxidation characteristics of various electrolytes was based upon the use of relatively pure aluminum such as 1100 alloy. As stated before, factors such as type of electrolyte, temperature, and concentration, have a pronounced effect on the characteristics of the oxide coating. Other factors such as voltage, current density, anodic oxidation time, agitation, also have an important effect upon the oxide coating produced with each type of electrolyte. One of the most important factors which influences the oxide coatings produced by anodic oxidation is the composition of the aluminum alloy.[23] Even aluminum of 99 per cent minimum purity, known as 1100 alloy, is in a sense an aluminum alloy from the standpoint of anodic oxidation as the impurities present have an effect on the characteristics of the coating. Any discussion of anodic oxidation must include the response of the various aluminum alloys to the anodic oxidation process because of their extremely important effect on the properties of the coating. Since anodic oxidation is a conversion of the surface into an oxide coating, the metallurgical structure has an important effect on the characteristics of the oxide coating.[24] The response of the different constituents of aluminum alloys varies considerably. Some constituents will be dissolved by the anodic reaction; whereas, others may be unaffected. For alloys where the constituents are dissolved during the

anodic treatment, the coatings will have voids which decrease the density of the coating. These voids also lower its resistance to corrosive action and abrasion. Aluminum-copper alloys are an example of this type. Silicon in aluminum-silicon alloys is an example of a constituent which is unaffected by the conditions of conventional anodic oxidation. Silicon particles remain unchanged in the coating in their original position. The dark coloration of welded and brazed fillets in which aluminum-silicon alloys are used is an example of the effect produced when such assemblies are anodically treated. For some applications, particularly architectural, the gun metal shade imparted to the anodic coating by the silicon in the alloy is desirable. Commercial applications include spandrels, facings and various trim components.

Some constituents of aluminum alloys will themselves oxidize under the conditions of anodic oxidation and the oxidation products will color the coating. Constituents such as manganese will produce a brownish-opaque appearance from the presence of manganese dioxide. Chromium as a constituent will give a yellowish tint to the coating from oxidation products of chromium. Although the phenomenon of oxidation of constituents is interesting, the reaction of all of the various alloying constituents is beyond the scope of this discussion. The important consideration is that alloy composition should be recognized as an important factor in determining the characteristics of the oxide coating. The concentration of constituents present or the purer the aluminum, the more continuous and transparent is the oxide coating. The so-called "super purity" aluminum produces the most transparent oxide coating. In this connection, it is important to mention the problem of appearance match in assemblies comprised of various alloys. It can be appreciated that care must be used in selection of alloys for assemblies, if it is desirable to obtain a uniform overall appearance match. Castings and wrought products in the same assembly are undesirable if a uniform appearance is required. With careful selection of alloy, a surface pretreatment can minimize differences in appearance. It must be recognized that anodic coatings reproduce the surface on which they are formed, therefore, a surface which has been textured either mechanically or by etching will in many cases solve the problem of overall appearance match.

Electrobrightening

The theory and mechanism of electrolytic brightening is complex and many details are still controversial. The common conception of electrobrightening processes for aluminum is based upon the so-called "solid film theory."[25] When aluminum is made the anode in an electrolyte which readily dissolves the oxide film at about the same rate at which it is formed, the result is a smooth, bright surface. Selective anodic solution occurs at microscopic high spots which are areas of the highest current density. The result is leveling action which produces bright mirror-like surfaces. Since the oxide is not always dissolved at exactly the same rate as it forms, an extremely thin porous oxide film may remain on the surface. Thereafter treatments, commonly referred to as "smudge remover dips," are used to dissolve this film selectively with no attack on the aluminum surface.

One of the most important commercial electrolytes for electrobrightening is fluoboric acid. Discovered in the United States by R. B. Mason[26] the fluoboric acid method is the essential step in the Alzak*[1] process for producing aluminum reflectors.

An electrolyte based upon a solution of sodium carbonate and trisodium phosphate was discovered in England by N. D. Pullen[27] and is known commercially as the "Brytal Process."*[2] It is also used to produce aluminum reflectors, and it generally is employed for brightening super purity aluminum.

Another important electrolyte for electrobrightening is a mixture of phosphoric, sulfuric and chromic acids and was developed in the United States by C. L. Faust of Battelle Institute.[28] Electrolytes utilizing mixtures of phosphoric acid and Carbitol are also available.[29]

Electrobrightening may be used alone or in conjunction with an anodic oxidation process. In the case of aluminum reflectors, electrobrightening is used to obtain increased reflectivity and the brightened surface is usually protected by an anodic coating. One of the most important commercial applications of electrobrightening is to remove surface contamination from the surface prior to anodic oxidation. The conversion of the aluminum surface into essentially aluminum oxide and the influence of certain alloy constituents on the structure and appearance of the coating have already been discussed. There are also other surface contaminants such as abrasive grain from polishing or buffing compounds which become embedded in the aluminum surface during these operations. If these particles are not removed and the surface is anodized, then they will be included in the oxide coating. The result is a cloudy, milky appearance which is more apparent on higher purity aluminum or aluminum alloys which by their composition should form transparent oxide coatings.

The function of electrobrightening is to remove a thin layer of surface metal containing the contaminants so that upon conversion of the surface to oxide they will not be present and detract from the transparency of the oxide coating. Electrobrightening is used on aluminum reflectors to produce smooth clean surfaces so that after formation of oxide coatings by anodic oxidation a transparent coating is obtained with high light transmission.[30] This results in a reflector with high reflectivity. This principle is also used commercially for numerous decorative applications where it is desirable to have anodized surfaces with bright metallic luster.

Another function of electrobrightening is the removal of burrs on sharp edges. For many applications it is more economical to remove such burrs by an electrochemical process rather than by mechanical means. Electrobrightening procedures based upon the phosphoric acid-Carbitol electrolyte are most satisfactory for deburring.

*[1]Trade name of Aluminum Company of America.
*[2]E. B. 30 Aluminum Company of America.

Commercial Applications

Aluminum and its alloys because of their light weight, ease of fabrication, high conductivity for heat and electricity and high resistance to corrosion have become an important modern material of construction. Since aluminum and its alloys have almost unlimited possibilities with respect to surface treatments, it is not surprising that the commercial applications are so numerous and of such wide variety.

The anodic oxidation type of surface treatment is one of the most important commercial treatments. These treatments incorporate various types of electrolytes and specific operating conditions which produce a wide variety of commercial finishes for both functional and decorative purposes.

The oxide coatings produced by the Alumilite process have many properties which make them commercially important. Alumilite coatings are essentially aluminum oxide which is a very hard substance. The hard aluminum oxide which is formed from the aluminum is integral with the surface, therefore, it will not chip or peel from the surface. This outstanding characteristic makes anodically coated aluminum more suitable for architectural applications. The high resistance to wear in combination with the attractive satin sheen of the Alumilite finish makes it a logical choice for aluminum hardware, handrails, mouldings and numerous other architectural components. The Alumilite finish reproduces the texture of the surface from which it is formed, therefore, a wide variety of attractive effects are possible by variation in the surface preparatory procedures. It is to be understood that there are many commercial architectural applications utilizing the natural finish, but for applications where it is desirable to preserve the initial appearance, the Alumilite finish will require less maintenance.

Recently procedures have been developed which produce finishes of greater thickness and density than the conventional types. These procedures require high current densities and low temperature electrolytes. These finishes are known commercially as Alumilite Hard Coatings and Martin Hard Coatings.[21-24] They have high resistance to abrasion, erosion and corrosion. These coatings have thicknesses in the range of 0.001 inch to 0.005 inch, whereas, the thickness of conventional Alumilite finishes is in the approximate range of 0.0001 inch to 0.0006 inch depending upon the application. This type of finish is rapidly becoming popular for commercial applications requiring light weight in combination with high resistance to wear, erosion and corrosion. These applications include helicopter rotor blade surfaces, pistons, pinions, gears, cams, cylinders, impellers, turbines and many others. The processing conditions for obtaining these hard coatings are such that thick coatings with maximum density can be obtained on most aluminum alloys. The selection of alloy is of utmost importance. The weights of anodic coatings on various wrought alloys formed by the conventional Alumilite procedure and Alumilite Hard Coating procedure are compared in Fig. 4.

The hardness of the Alumilite coating and the processing variables which have an influence on its formation have already been discussed. Since the oxide coating is a brittle substance as compared to the aluminum underneath, it will crack if the surface is bent. It is possible, however, to produce oxide coatings which are relatively flexible, but in general, the thicker coatings formed in sulfuric and oxalic acid electrolytes will crack or craze to a much greater extent than oxide coatings formed in a chromic acid electrolyte. For many applications, this cracking may not be objectionable, since it is usually difficult to detect by visual observation. These fine cracks have an adverse effect on the bending properties of the metal, however, and may sometimes cause fracture if the bends are severe. For this reason, it is generally recommended that the Alumilite finish be applied after forming. The effect of anodic coatings on the fatigue properties is another important consideration. If fatigue is a critical factor because of alloy, design or some other reason, then proper allowance must be made which recognizes the reduction in endurance limits produced by these thick coatings. The results of fatigue tests on specimens with the conventional Alumilite coatings indicate that a coating 0.0001 inch thick on smooth surfaces will have little effect on the fatigue strength. Thicker coatings in the range of 0.0003 inch to 0.0005 inch on smooth surfaces have a slight detrimental effect at high stresses.[25]

Alumilite coatings provide substantial protection against corrosion. There are many factors which must be considered in this connection. One of the most important is the continuity of the coating. Here again, the choice of alloy is of great importance. Since continuity of coating is dependent upon constituents present in the alloy, Alumilite coatings on high purity aluminum are the most resistant to corrosion. On the other hand, anodic coatings formed from aluminum-copper alloys have much lower resistance to corrosion. Sealing of Alumilite coatings in dichromate solutions results in an appreciable improvement in resistance to corrosion particularly by chlorides. The results of atmospheric exposure tests indicate that Alumilite coatings with a thickness of 0.004 inch or greater will provide greatly increased resistance to weathering. This is important for architectural applications where preservation of the original appearance is the desired characteristic. The increased resistance to corrosion and abrasion provided by the Alumilite finish are characteristics which make this finish desirable for transportation, marine, appliance and textile machinery applications.

The absorption characteristics of certain types of Alumilite coatings are one of their important characteristics from the commercial standpoint. This characteristic makes possible their wide range of applications for nameplates, panels, appliance trim, optical goods, cameras, fishing reels, instruments, giftware and jewelry (Fig. 5). The ability of Alumilite coatings to absorb coloring substances such as dyestuffs and pigments makes it possible to obtain these finishes in a complete range of colors including black. The colors are unique as the luster of the underlying metals gives them a metallic sheen which is attractive particularly for applications which simulate metals such as gold, copper, bronze and brass. Colorants are available which when used to color Alumilite coatings on the proper alloys

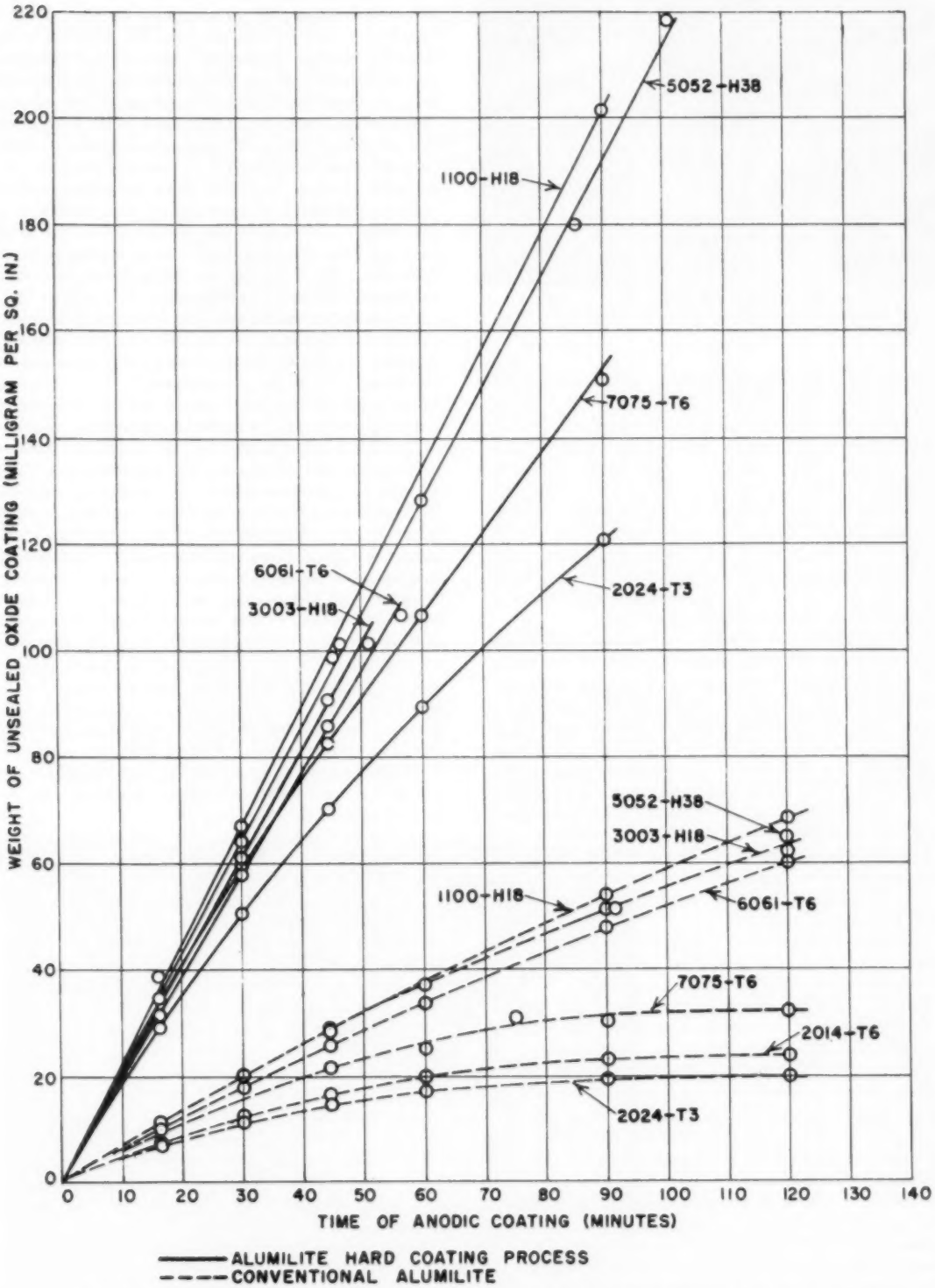


Fig. 4. Curves comparing anodic coating weights of conventional Alumilite and Hard Alumilite for various alloys

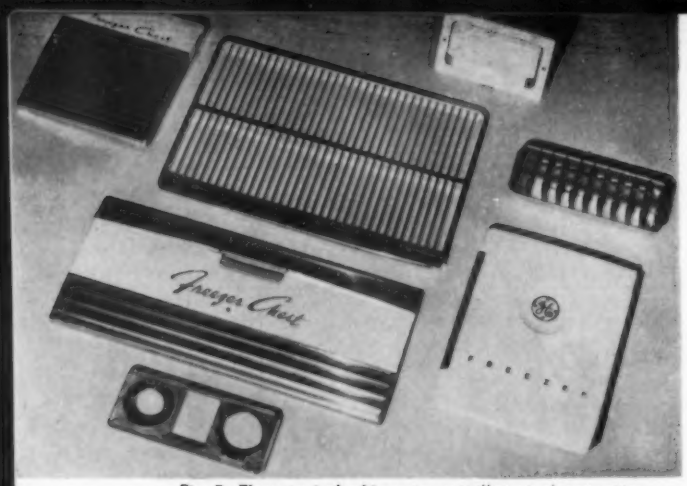


Fig. 5. These typical refrigerator parts illustrate the attractive, durable finishes possible using a combination of buffing, electrobrightening, chemical brightening, Alumilite and enamel

will reproduce the natural colors of the metals listed above. The so-called Alumilite Gold finish has proved a success for light weight aluminum costume jewelry. In fact, watch cases with the same finish are in commercial production. For such applications high purity aluminum-magnesium alloys are required as these alloys combine the necessary mechanical properties with the desired finishing characteristics. Buffing in combination with electrobrightening or chemical brightening are the necessary surface preparatory treatments for the Alumilite finish. For any application where maximum metallic luster is desired, this is the recommended practice.

The possibilities of either colored or uncolored Alumilite finishes in the metal decorating field are practically unlimited. The selective application of color made possible by the use of suitable "resist" materials provides a wide variety of decorative schemes. The increased use of aluminum in the appliance field for trim, escutcheons, panels, shelves, racks, trays, containers and many others have been made possible to a great extent by the attractive, durable finishes produced by the Alumilite process. Pastel or metallic colors are popular for the appliance applications, however, the ability of the Alumilite process to produce both matte and glossy black finishes has provided durable finishes for aluminum applications in instruments, optical goods and firearms.

Alumilite coatings made in sulfuric and chromic acid type electrolytes have long been accepted commercial finishes for a wide variety of aircraft applications. Colored Alumilite coatings are used for identification purposes where permanence is of utmost importance. Dichromate sealed Alumilite coatings provide increased resistance to corrosion. In this connection new applications involving the Alumilite Hard Coating and the Martin Hard Coating should again be mentioned as these coatings are proving to be of real value when resistance to wear, erosion and corrosion in combination with light weight are the important considerations.

Since aluminum oxide is a good dielectric, the Alumilite coating has good electrical insulating properties. Although substantial commercial applications of anodic coatings based upon this property have not yet been made, it is nevertheless one of their outstanding properties. For instance, anodic films produced in boric acid electrolytes are used commercially on aluminum foil for electrical capacitors. The voltage necessary to break down the Alumilite coatings is generally proportional to the thickness. Alumilite coatings 0.0006 inch thick on 1100 alloy have an approximate breakdown voltage of 600. Breakdown voltages vary considerably even on the same thickness of coating on the same alloy. This variation is caused by weak spots in the coating. These coatings have considerable electrical insulation value particularly at low voltages and have the advantage of good resistance to temperature. The Alumilite Hard and Martin Hard Coatings have extremely high voltage breakdown characteristics. Hard coatings on certain alloys have been measured at values over 3,000 volts.

During the discussion relative to electrolytes, the anodic oxidation of aluminum and its alloys in phosphoric acid solutions was mentioned in connection with preparing aluminum surfaces for electroplating. Since this is a rather unique application of anodic coatings, it might be in order to discuss the procedure in more detail. The use of an oxide layer as preparation for electroplating seems illogical since the natural oxide film on aluminum surfaces has been the greatest obstacle to utilizing conventional electroplating procedures employed on other metals. There are two characteristics of anodic coatings which appear to explain this apparent anomaly. First, anodic coatings are porous and by the use of specific conditions of anodic oxidation coatings can be formed which have pores large enough so that metal deposition takes place in the pores. Such a condition will "key" the deposit to the coating. The other characteristic is that oxide coatings are integral with the metal, therefore, adherent electrodeposited layers are possible. Copper, nickel, cadmium, silver and iron have been successfully deposited over the oxide coatings. Plating solutions which are highly alkaline should be avoided as they will attack the coating and destroy the porous structure necessary for the best adhesion.

Anodic oxidation in oxalic acid and phosphoric acid electrolytes produces coatings which have been successfully used as preparatory treatments for electroplating. The Krome-Alume process utilizes an oxalic acid electrolyte to form the oxide coating. Subsequent modification of the coating with hydrofluoric acid produces a structure satisfactory for electroplating. The anodic oxidation process utilizing a phosphoric acid electrolyte produces a structure which requires no further modification to condition it for electroplating. Instead of a separate modification step the operating conditions are varied to obtain the necessary structure for a high degree of adhesion. As in the case of other types of anodic oxidation, the alloy has an important effect on the structure of the coating necessary for best results in electroplating. Specific operating conditions and concentration of phosphoric acid are necessary for each alloy. In general, the phosphoric anodic process is not recommended for preparing high purity aluminum, aluminum-magnesium wrought alloys and most die casting alloys for electroplating. Electroplating applications requiring electrical conductivity cannot be prepared by an anodic oxidation process since the anodic coatings are insulators.

Method of Application

The holding devices or racks used for anodizing are different from those ordinarily employed for electroplating. Since the oxide coating is a dielectric, the initial rack contact with the surface must be maintained firmly throughout the anodic oxidation cycle. This excludes holding devices using hooks which are used in electroplating. Any movement from the initial contact position will result in defective work as the anodic coating will offer enough resistance to the passage of current and little or no anodic coating will be formed. The rack, also, must be constructed from aluminum as other metals will dissolve. Rack contacts are sometimes made from tantalum, a metal which is not dissolved or anodic coated by the conditions employed for commercial anodizing. Recent developments indicate that titanium can also be used for contacts. Since it is less expensive than tantalum, it has greater commercial possibilities. This anodic solution of dissimilar rack material will use the current intended for forming the oxide coating on the parts. Aluminum assemblies containing metals other than aluminum will also exhibit this same phenomenon. Anodic coatings which form on the aluminum rack and contacts must be removed before reuse. Special stop-off material similar to those employed in electroplating are available for application to anodizing racks. Such materials conserve racks and simplify calculation of current requirements required for various loads.

Cooling and adequate circulation[36, 37] of the electrolyte is required, since the anodic oxidation process is exothermic. In general, the heat generated is approximately equal to the total electrical energy input calculated in terms of heat. The electrolyte should be operated below or slightly above room temperature except for the Alumilite or Martin Hard Coating processes which are operated from 20°–40° (F) below room temperature.

Alumilite coatings are applied to aluminum and its alloys by a variety of methods which include batch, bulk, continuous conveyor and continuous strip.

The batch method of applying Alumilite coating is similar to the conventional batch process employed in electroplating except, of course, the parts are anodic instead of cathodic. The continuous conveyor method also is similar to the conventional plating method. The equipment is similar in design and is used for high production of similar parts. Commercial applications utilizing this type of equipment include appliance trim parts and aluminum furniture. An installation of this type is shown in Fig. 6 which is in commercial use involving various tanks for cleaning, bright dipping, etching, anodizing, coloring and sealing. Such installations may reach total lengths of over 400 feet.

The bulk method for applying Alumilite finishes to small parts such as rivets, washers, screws, etc., is radically different from the bulk methods employed for electroplating. Bulk electroplating of small parts is accomplished in rotating barrels. This method is not suitable for applying Alumilite coatings because the initial flow of current forms an anodic coating on the parts and even if they contact each other during the rotation of the barrel, no current will flow through these contacts because the coating is an insulator. Bulk methods for applying Alumilite coatings utilize special perforated nonmetallic cylindrical containers. Pressure is applied to the mass of parts in the container through a threaded center contact post. This pressure maintains the initial contact between the surface of the parts.

The continuous strip process is being used commercially to apply Alumilite coatings to aluminum sheet which is subsequently roll formed into weather strip.[38] In Europe, this same process is being used to apply anodic coatings to aluminum sheet which is formed into food containers such as sardine cans.

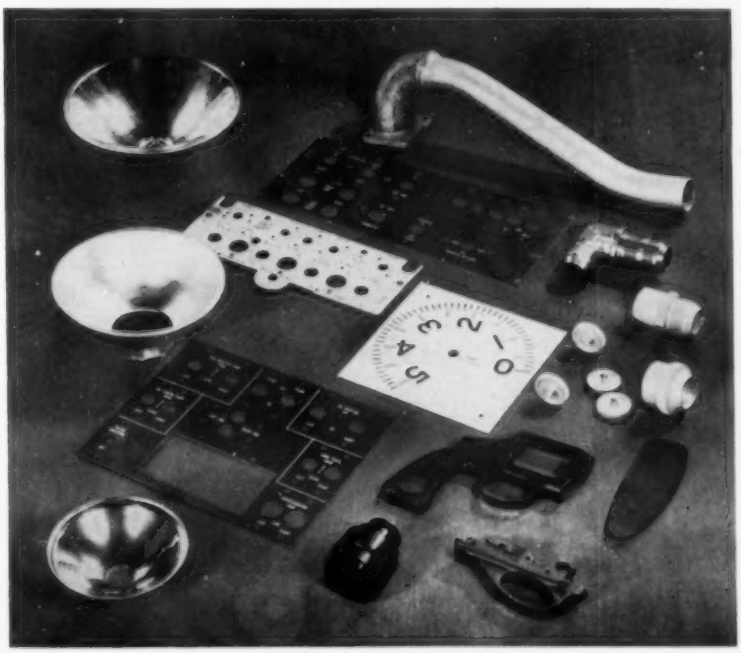
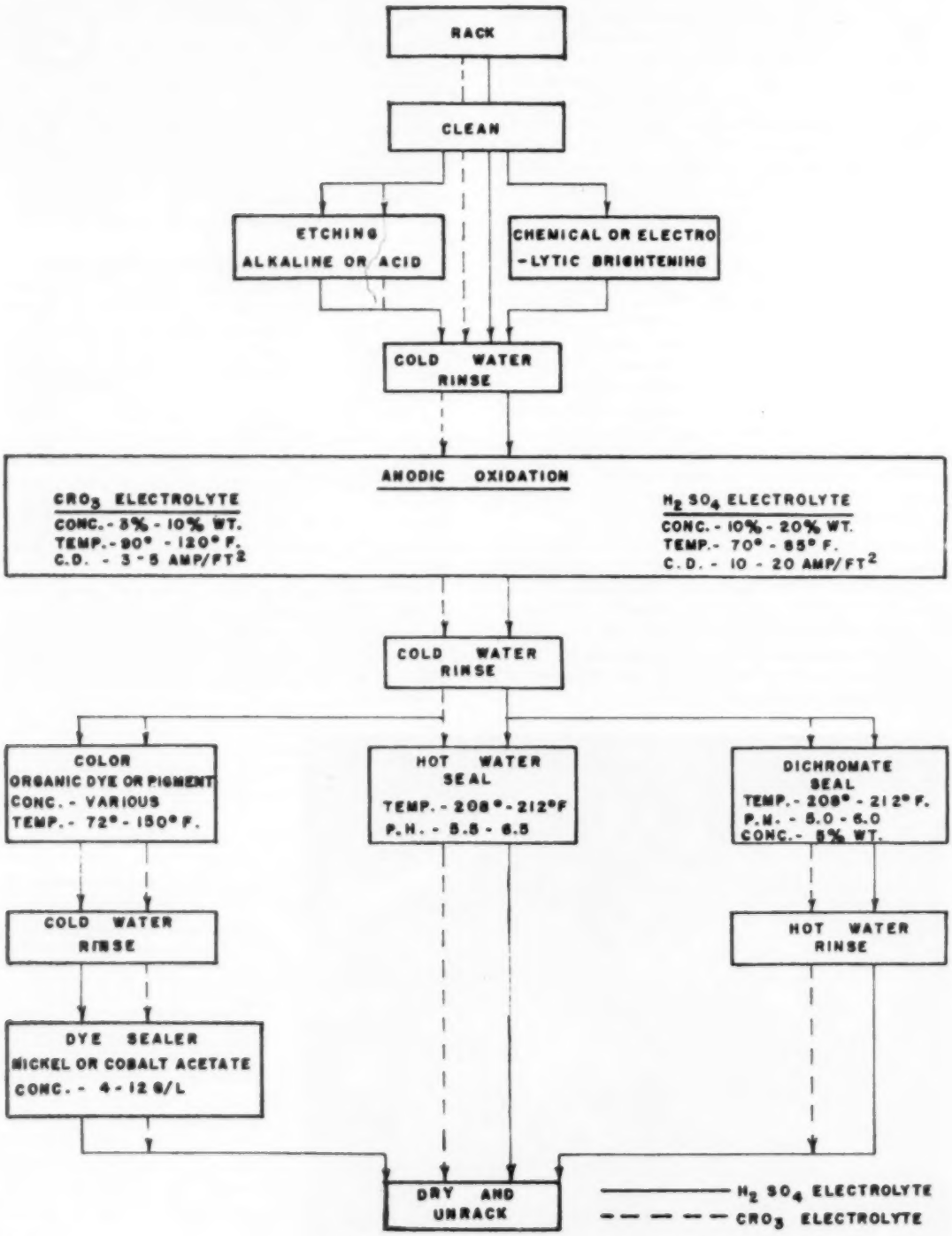


Fig. 6. An electrobrightening process produces either specular or diffuse reflectors, which are protected by an oxide coating. A dichromate-sealed anodic-oxide coating, with a characteristic yellow color, provides excellent corrosion resistance on aluminum gears and instrument panels. Other control panels, and the colored tubular aircraft fitting, have standard electrolytic-oxide coatings, while the gun and instrument parts are sulfuric acid oxide coatings and dyed black

Table III

Sesquence of operations and general operating details for application of plain and color anodic coatings. (Sulphuric and chromic acid electrolytes)



Testing Methods and Specifications

There are several reliable methods for testing the quality of anodic coatings. These include the following ASTM designations: B110-45, B137-45, B136-45 and B244-49T.* The B110-45 method is based upon the voltage breakdown test as a means of determining coating thickness. Method B137-45 is based upon a chemical procedure for determining the weight of oxide coating. Method B136-45 is a staining test to determine the effectiveness of the sealing treatment. One of the important nondestructive tests for measuring coating thickness is described in B244-49T. This method is based upon measuring coating thickness with a Filmeter.† This instrument in the hands of an experienced operator produces results which closely check microscopic measurements. ASTM salt spray method B117-49T is used to determine resistance to corrosion. Humidity tests are sometimes used for testing anodic coatings to be used in household refrigerator parts.

* Available from the American Society of Testing Materials, 1916 Race Street, Philadelphia, Pa.

†American Instrument Company.

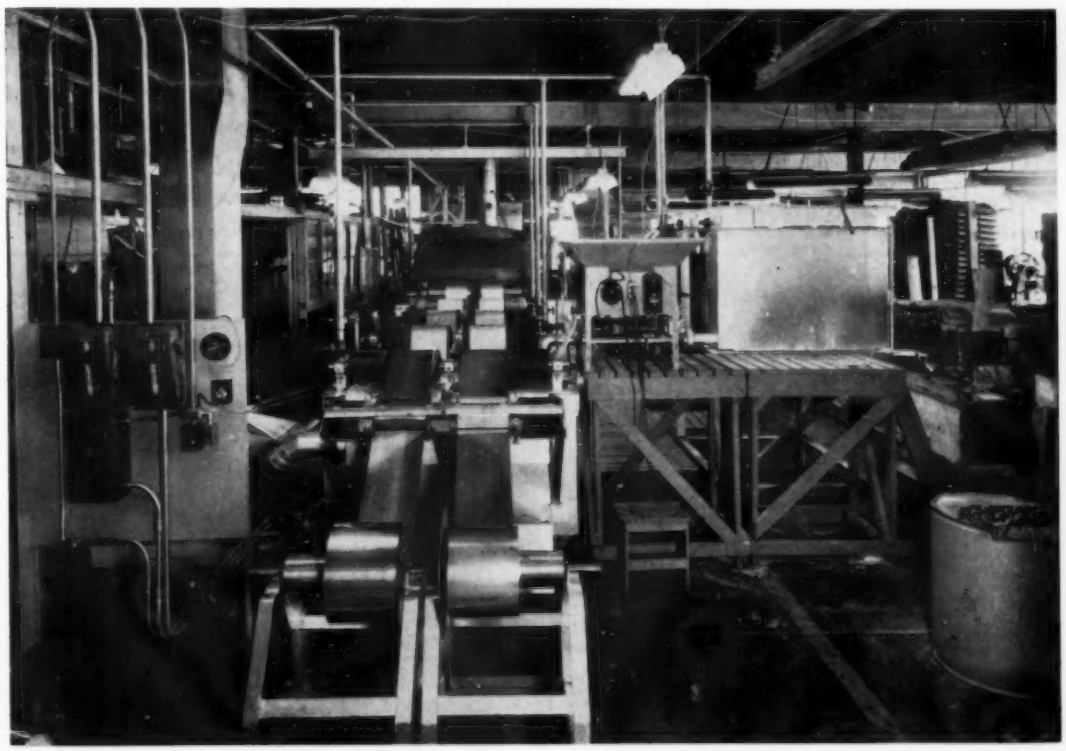
A rapid test for determining the quality of anodic coatings is based upon the use of a sodium chloride—cupric nitrate solution. A 10 cc portion of stock solution composed of 10 grams of $Cu(NO_3)_2 \cdot 3H_2O$ and 200 grams of NaCl per 1000 cc of distilled water is diluted to 1000 cc with distilled water. Immersion of the coated surface which has been scratched to expose a small area of underlying aluminum in this solution will result in precipitation of copper in the weak spots of the coating. The appearance of small dark spots indicates the points of failure. A large number of spots indicates an inferior coating either from the standpoint of poor sealing or lack of thickness.

Keller describes a microscopic examination for obtaining coating thickness which is considered to be the most accurate available.[39] This test is destructive and in most cases impossible to use on actual production parts as a routine production test.

Abrasimeter tests utilizing an air-abrasive blast mixture yield reproducible results.[40] This method is based upon accurately weighing the amount of abrasive material required to wear through the coating under controlled conditions. These results can be correlated with coating thickness so that the method can be utilized as a thickness measurement in addition to measuring the resistance to abrasion. It is, of course, a destructive method and requires a flat surface of definite size.

Military specifications MIL-A-8625 and FXS-963 are the two important ones relating to anodic coatings. FXS-963 specification involves a 250 hour salt spray test in accordance with U. S. Army specification 57-0-2. Visual inspection to determine the number of corrosion spots is required. MIL-A-8625 is based upon weight of oxide for

Fig. 7. Front end view of equipment used for application of Alumilite coatings to strip sheet by full continuous process



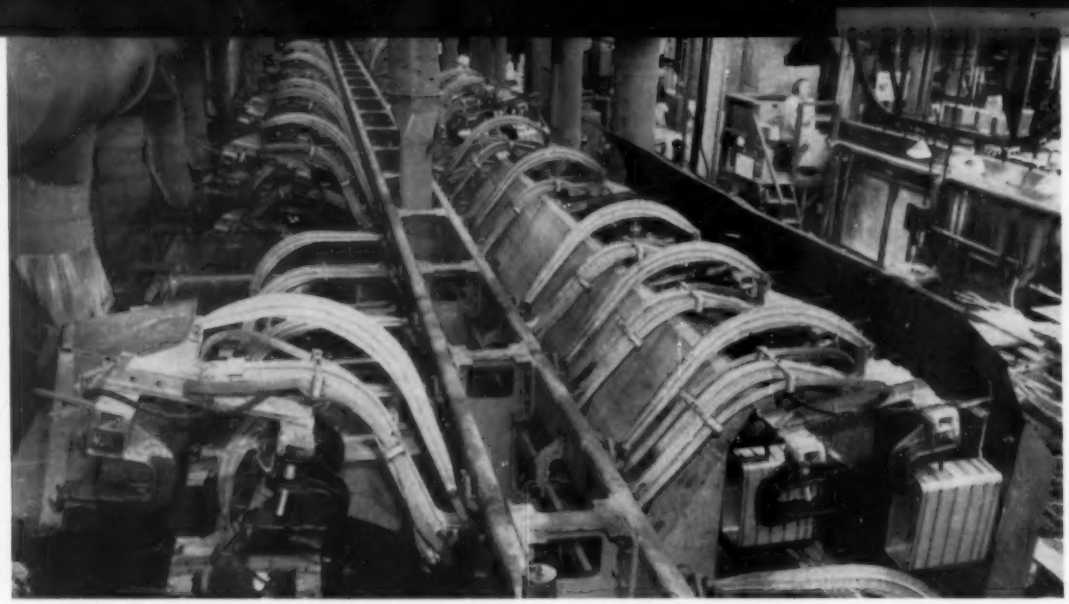


Fig. 8. General view of automatic feed continuous batch machine used to apply Alumilite finish to refrigerator evaporators

coatings made in both sulfuric and chromic acid electrolytes. Referee tests are based upon submitting 2024-T4 coupons to salt spray tests in accordance with QQ-M-151. Aeronautical materials specification AMS-2470-C is also an important commercial specification and involves a 250 hour salt spray exposure and subsequent tensile tests of 2024-T4 sheet specimens to determine if there is a reduction in tensile strength below 62,000 psi or the elongation has been reduced below 12 per cent.

There are, of course, many individual company specifications relating to anodic coating quality. Such specifications are based upon voltage breakdown, salt spray resistance, humidity tests, coating weight and sealing tests.

With the many types of finishing systems that are available for aluminum and its alloys including etching, electroetching, electroplating, chemical conversion, chemical immersion, paint, lacquer, and porcelain enamel, it is not surprising that this metal is a logical choice for many modern commercial applications.

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Russel V. Vanden Berg obtained his BS in Metallurgical Engineering from the University of Michigan in 1940.

Vanden Berg is associated with the Aluminum Company of America as Manager—Finishes Div. Process Development Lab.

He has been a member of the Pittsburgh Branch of the AES since 1946. In addition, he is also Director of the Hillcrest Country Club, New Kensington, Pa.

ANALYTICAL DETERMINATION OF TRACE CONSTITUENTS IN METAL FINISHING EFFLUENTS

XI. The Determination of Nitrate-Nitrite Nitrogen in Effluents

E. J. SERFASS† AND R. F. MURACA*

THE FOLLOWING PAPER, THE ELEVENTH OF A SERIES, IS A RESULT OF THE WORK SPONSORED AT LEHIGH UNIVERSITY BY THE AES AND THE OHIO RIVER VALLEY WATER SANITATION COMMISSION. WHILE THE ORIGINAL PROCEDURE WAS WORKED OUT UNDER AES SPONSORSHIP, THE MODIFICATION WAS DEVELOPED UNDER ORSANCO SPONSORSHIP, THE COMMISSION HAVING PLACED THE PROJECT AT LEHIGH SO AS TO BE ABLE TO UTILIZE THE BACKGROUND DEVELOPED BY AES PROJECT NO. 2. IT SHOULD BE NOTED THAT THE METHODS DESCRIBED IN THIS SERIES WERE TESTED, MODIFIED IF NECESSARY, AND RETESTED BY AT LEAST SIX AND SOMETIMES AS MANY AS TWELVE INDUSTRIAL LABORATORIES. AS A RESULT OF THIS, THE APPROVED FORM, AS PUBLISHED HERE, WAS DEVELOPED.

This procedure for the determination of nitrate and nitrite nitrogen is essentially that currently recommended by the APHA except that a distillation of ammonia is used to remove interfering substances.

The procedure involves a removal of ammonia from the sample, a reduction of the nitrate and nitrite content to ammonia by aluminum, the distillation of the ammonia, and the determination of the ammonia content of the distillate in the usual manner with Nessler's reagent.

The Determination of Nitrate—Nitrite Nitrogen In effluents

The determination of nitrite and nitrate nitrogen in effluents may be of importance in policing a potable water supply where it becomes necessary to trace the source of abnormally large quantities of nitrogen. The method presented here does not differentiate between nitrite and nitrate in nitrogen.

Description of the Method

The sample is made alkaline and boiled to remove ammonia. Then, the nitrate and nitrite content of the sample is reduced by aluminum metal in an alkaline medium. The resulting ammonia is distilled off after the addition of sodium sulfide and the distillate is treated with Nessler's solution in the usual fashion. Organic compounds which may react with ammonia in basic solution or which may generate ammonia on reduction or hydrolysis in basic medium obviously will invalidate the results that are obtained by this method.

Sensitivity of the Method

The sensitivity of the method is defined as the number of micrograms of nitrogen which can be determined with a relative error of ±50 per cent. For the following recommended procedure, this corresponds to 2 ppm or 200 micrograms of nitrogen in the 100 ml sample taken for analysis.

Limit of Detection of the Method

The limit of detection of the method is defined as the minimum number of micrograms of nitrogen which must be present in the 100 ml sample taken for analysis so that an extinction of 0.005 will be obtained in Step 8 for a 1-cm. cell thickness at 400 millimicrons. For the recommended procedure, the limit of detection is 50 micrograms of nitrogen (0.5 ppm).

Recommended Procedure

This procedure is essentially the method appearing in "Standard Methods for the Examination of Water and Sewage" 9th edition (1946), except that a distillation is carried out to remove ammonia from interfering substances.

Reagents Required

(1) Sodium Hydroxide Solution: Dissolve 250 g of NaOH (special low in *N*) in about 1250 ml of water. Add several strips of aluminum foil and allow the evolution of hydrogen to continue overnight. Concentrate the solution by boiling and dilute to 1 liter.

(2) Aluminum Foil: Use strips of 30-gauge pure aluminum sheet about 10 cm long, and 6 mm wide.

(3) Sodium Hydroxide-Sodium Sulfide Solution: Saturate 250 ml of 25 per cent w/v NaOH solution with H_2S gas. Mix this solution with 750 ml of 25 per cent w/v NaOH solution.

(4) Hydrochloric Acid Solution: Approximately N/10.

(5) Gum Arabic Solution: 2 per cent w/v.

(6) Nessler's Solution: Dissolve 50 g of potassium iodide in approximately 35 ml of cold, ammonia-free water. Add slowly a saturated solution of mercuric chloride until the first slight precipitate of red mercuric iodide

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persists, and then add 400 ml of a 9 *N* solution of sodium hydroxide. Dilute the solution to one liter with ammonia-free water and allow it to clarify by settling. Siphon off the clear supernatant liquid.

(7) Standard Nitrogen Solution: Dissolve 1.445 g of dry reagent grade potassium nitrate and dilute to exactly one liter.

1 ml = 0.20 mg nitrogen

Special Equipment

Kjeldahl distillation equipment with 300 ml flasks.

Procedure

(1) Pipette a 100 ml sample of the effluent into a casserole and add about 10 ml of NaOH solution.
For a blank use 100 ml of distilled water.
When establishing calibration curves, use 100 ml of water and add 1 ml of the potassium nitrate solution for each 2 ppm of nitrogen.

(2) Concentrate the sample to about 20 ml by boiling.

(3) Rinse the concentrated sample into a 300 ml Kjeldahl flash and add 3 strips of the aluminum foil. The volume of liquid should be about 60–75 ml. Connect the flask to the condenser via the spray trap. Allow the reduction to take place for at least 8 hours at a minimum temperature of 20°C.

(4) Place the Kjeldahl flask in its place in the distillation apparatus.

(5) Set a 125 ml Erlenmeyer flask containing 20 ml of 0.1 N HCl so as to receive the distillate. Be sure that the end of the condenser dips well under the acid in the flask.

(6) Add 40 ml of the sodium hydroxide-sodium sulfide solution to the Kjeldahl flask and immediately connect the flask to the distilling apparatus. Then shake the flask so as to mix the contents very well. Collect between 50 and 60 ml of distillate in the acid solution.

(7) Transfer the distillate to a 100 ml volumetric flask and dilute to the mark.

(8) Pipette 10 ml of this solution into a 100 ml volumetric flask.

(9) Add 3 drops of a 2 per cent gum arabic solution; swirl the contents of the flask.
Add 1 ml of Nessler's reagent and mix well.
Dilute up to the mark with water, shake well, and wait 5 minutes.

(10) Set the colorimeter to zero with water using a blue (No. 42) filter. With a spectrophotometer set the instrument to read 100 per cent T with water at about 400 millimicrons.
The intensity of the developed color (turbidity) can be estimated by comparing the sample against Nessler standards.

(11) Transfer the solution from step (6) to the sample cuvette and read the colorimeter.

(12) If necessary, convert the scale readings of the photometer to extinction. Subtract the blank reading from the sample readings. If a calibration curve is being established, plot these corrected readings versus ppm of nitrogen. If a sample is being run, read the amount of nitrogen from the calibration curve.

Variation of the Recommended Procedure

When the composition of the effluent is known, the recommended procedure for nitrites and nitrates can be materially shortened.

The following table summarizes the changes which can be made in the recommended procedure when the composition of the sample is known. Unless otherwise stated, the concentration of other elements must not exceed 100 ppm. For effluents containing greater quantities of these elements dilution may be necessary. The effluent should be between pH 2 and 9.

Table I

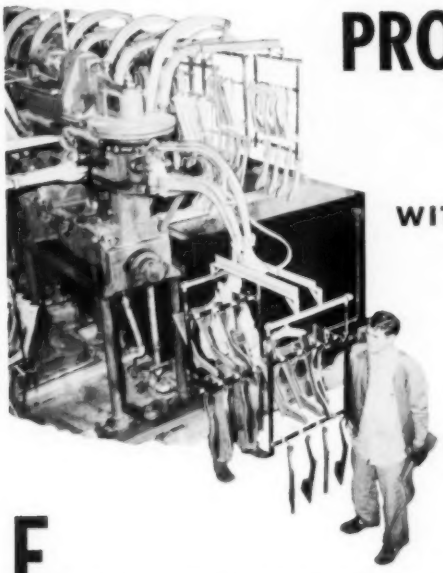
Composition of Effluent	Changes in the Recommended Procedure
Alkali metals, alkaline earths, zinc, and aluminum below 100 ppm each; all other elements below 10 ppm each. Cyanides, thiocyanates, and sulfides below 1 ppm.	Pipette a 10 ml sample of effluent into an evaporating dish. Add 25 ml of water and 5 ml of NaOH solution. Evaporate to about 15 ml. Transfer to a 125 ml flask and dilute to about 50 ml. Add 1 piece of aluminum foil and stopper loosely. Transfer to a 100 ml volumetric flask and start with step 8 of the recommended procedure.

Dr. Ralph F. Muraca has been a regular contributor to Plating. He was an assistant professor in the department of chemistry at Lehigh University until August 1, 1955 and was more recently associated with an AES committee which studied the style and format of Plating. Dr. Muraca worked in cooperation with the ORSANCO committee on metal finishing wastes which recently published the book on "Procedures for Analyzing Metal-Finishing Wastes." This report incorporates results of AES Project 2 at Lehigh University with which he was also associated. Dr. Muraca is presently group leader, Analytical Chemistry Department, Jet Propulsion Labs at California Institute of Technology. (Div. of Cal. Tech.)

Dr. Earl J. Serfass, a recognized authority in the fields of chemistry, electrochemistry and metallurgy, is serving his second consecutive term as chairman of the important AES Research Committee. He is presently compiling for the AES a "Process Control Handbook." Recently he worked in cooperation with the Ohio River Valley Sanitation Commission which has just released a book on "Procedures for Analyzing Metal-Finishing Wastes," incorporating the results of AES project 2 at Lehigh University.

STEVENS *Slants* ON METAL FINISHING

"FROM THE CASTING OR STAMPING TO THE FINAL FINISH"



PRODUCTION JOBBING PLANTS ARE CUTTING COSTS

WITH STEVENS AUTOMATIC PLATING AND PROCESSING MACHINES

FIRMS doing production electroplating and immersion processing on a contract basis have found the installation of automatic equipment brings a number of advantages to their operations.

Frederic B. Stevens, Inc., has long paid much attention to the needs of production platers and metal finishing plants and have developed automatic equipment that will fit the needs of any size plant, both from the standpoint of production requirements and capital investment.

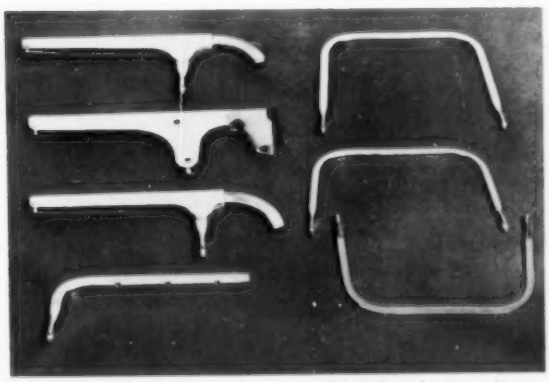
The chief advantages of automatic equipment are:

1. Improved plant layout requiring less floor space and resulting in less time loss by unnecessary movement of the operator.
2. Uniformity of deposit thickness which is especially important where specification electroplating is required.
3. Fewer rejects due to accidental marring of finishes as parts are transferred manually from one tank to another.
4. Unskilled workmen can operate equipment.
5. Better working conditions.
6. Easier chemical control.
7. Easier scheduling of work–better delivery to customers.
8. Lower plating cost per piece.

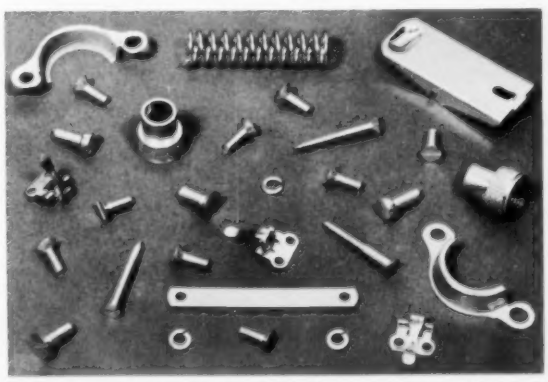
Numerous production shops throughout the United States are now using Stevens automatic equipment. For years the Stevens Model "C" automatic barrel has been a profit maker to platers. It will turn out hundreds of pounds of plated small parts daily.

The machine is versatile and will handle a diversified group of parts – so important to production plants doing contract work.

Stevens "Little Steve" is a new type machine which fits ideally in the production picture. It is a small machine with high production at an initially low cost.



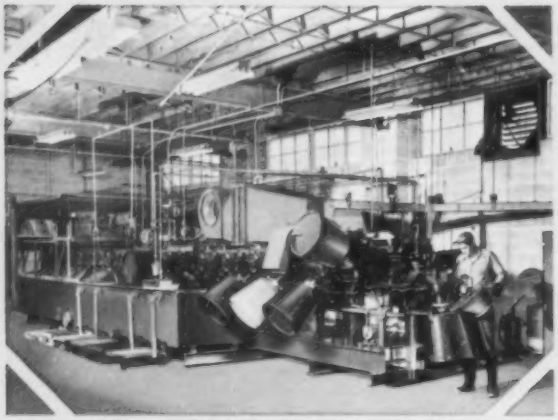
Typical parts plated on a Stevens Model "A" rack type plating in a production plating shop.



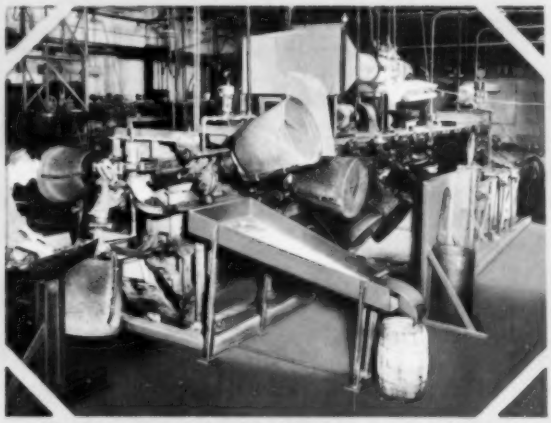
The Stevens Automatic Barrel Machines turn out thousands of pounds of plated small parts daily.

STEVENS *Slants* ON METAL FINISHING

A page from the
STEVENS SCRAPBOOK
FEATURING AUTOMATION IN
PRODUCTION JOBBING PLANTS

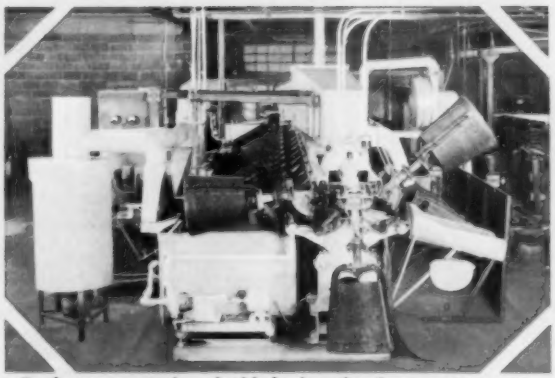


Homer A. Doerr and Son, St. Louis, Mo., plate a variety of small parts in quantity to closer tolerances with this Stevens Automatic Barrel. Operating costs have been reduced.

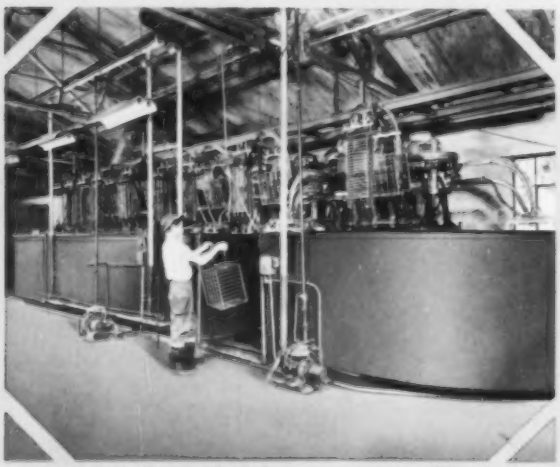


Reilly Plating Co., Melvindale, Michigan, turn out big orders of cadmium and zinc plated small parts with this Stevens Automatic Barrel Machine which gives them faster delivery.

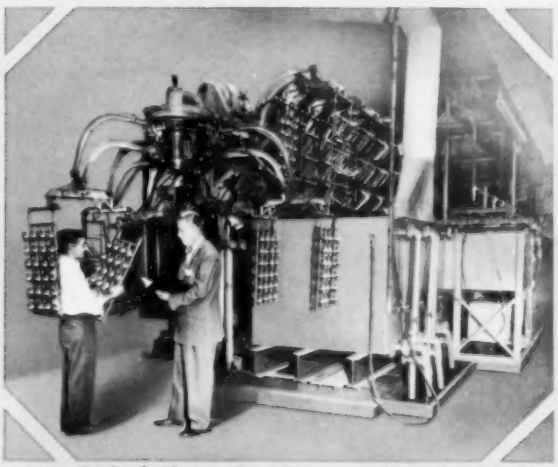
Spectranome Plating Co., Inc., New York City, electroplate fine nickel finishes with this Stevens Automatic Barrel Machine. This machine was the 750th Automatic produced by Stevens.



Production more than doubled when this Stevens Automatic Barrel Plating Machine was installed by Midwest Plating and Chemical Corporation, Kokomo, Indiana



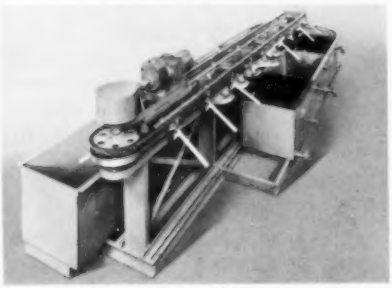
Plating both Zinc and Cadmium parts, the Olds Plating Corporation, Detroit, Mich., finds this Stevens Model "A" Plating and Processing Machine keeps deliveries rolling.



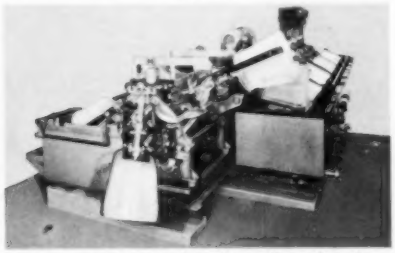
New England Plating Co., Worcester, Massachusetts, do nickel plating dichromating quickly – economically on Stevens Automatic Plating and Processing Machines.

STEVENS Slants ON METAL FINISHING

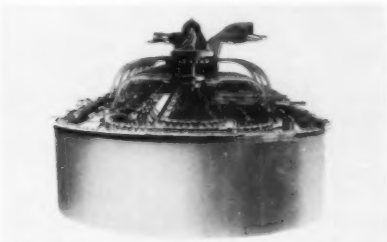
STEVENS MACHINES FOR PRACTICAL JOB-SHOP AUTOMATION



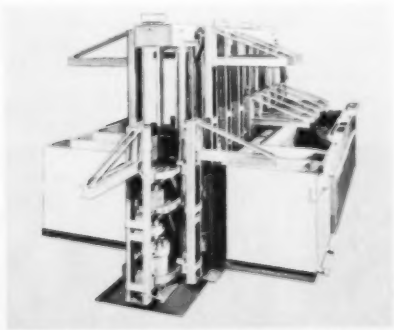
Low initial and low operating costs are features of this newly introduced small automatic which has a big capacity for its size.



A proven automatic barrel machine for plating and processing small parts. Only unit with fully automatic load and unload features.



A compact automatic processing machine, embodying the famous Stevens auxiliary cam shaft and lifters for rapid vertical transfer.



Unit's load capacity, mechanical flexibility and lift design meet tomorrow's increased safety and production requirements.

"LITTLE STEVE" PAYS OFF

THE FINISHING TOUCH

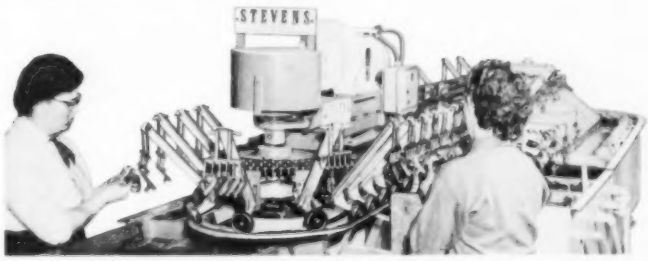
by A. B. HOEFER
vice president
FREDERIC B. STEVENS, INC.

Production Plater Finds Machine Ideal For Zinc Plating

There's a feeling of satisfaction among the people in our company when a Stevens machine is installed and does a better job than the customer anticipated. That feeling reaches all the way from President through engineers, salesmen and typists who write up the specifications.

We are particularly proud of an installation of one of our "Little Steve" machines made recently for the Miller-Smith Manufacturing Company, Spring Lake, Michigan. The partners, John Miller and George Smith, are operating an aggressive business in job buffing and plating, and after receiving some of our literature including a story on the "Little Steve," soon made a purchase from us.

The "Little Steve" fit ideally into their program. The capital outlay met their requirements and the machine is daily turning out a big quantity of zinc plated parts for them. In fact, 105,000 can be plated each working day, which right now is an around-the-clock operation. Just as soon as new racks are built they expect to double present production on some of the parts.



The Miller-Smith management tell us that they are operating much more efficiently now than they did previously with a competitive machine. Parts are being zinc plated to a .0002 thickness every three minutes. They are saving on valuable floor space too, for the "Little Steve" occupies only 162 square feet as compared to 441 square feet used by their previous equipment.

When we asked for comments about the "Little Steve" from Messrs. Miller and Smith, they said: "We are well pleased with the machine —in fact, we're proud of it. We'll be glad to recommend it to anyone." While we are not unused to such comments on our various machines, each new one gives us a warm glow of satisfaction.

This efficient machine fits easily into existing factory layouts because of its size. Only seven feet wide and ten or more feet in length, it can be placed on a factory floor without moving existing machinery.

For further information write to Frederic B. Stevens, Inc., Detroit 16, Michigan.

FREDERIC B. STEVENS INCORPORATED
YOUR METAL FINISHING SUPERMARKET
DETROIT 16, MICHIGAN

METAL FINISHING EQUIPMENT AND SUPPLIES FROM CASTINGS OR STAMPINGS TO FINISHED PRODUCT

BRANCHES:
Buffalo • Cleveland • Indianapolis • New Haven

STEVENS *Slants* ON METAL FINISHING

TIPS AND TATTLE

While there has been automation in plating for a good number of years, it has been only recently that the big trend has been to *complete* automation. This means automatic load and unload of parts in a continuous flow of production operation. F. B. Stevens, Inc., has developed several load and unload devices, which might be added to existing plating equipment. Why not check with our engineers?

• • •

McGraw-Hill's survey of business for 1956 estimates a 13% gain in industrial and commercial outlays for construction and for new equipment. New orders and the backlog on our books indicate that plating and processing machines will play an important part in these gains.

• • •

The meteoric rise in use of aluminum is being met by Stevens with automatic machines for bright dipping, anodizing and dyeing of various fabricated parts. We were privileged, recently, to see an advance proof of an article to appear soon in the magazine *Modern Metals* on aluminum finishing by Light Metal Processors, Inc., Chicago, Ill. If you are interested in aluminum finishing, we think you will find it interesting. If you do not have this magazine available, write us and we will obtain a reprint for you.

• • •

Helpful toward greater shop productivity are Stevens L.V. reports. These reports tell you the type of buffs, speeds, compositions to use on specific buffing and polishing jobs. These reports are a free service by F. B. Stevens, Inc.

• • •

We have for distribution three interesting reprints on subjects of interest to plant managers and others concerned with metal finishing operations. These articles cover: "Automatic Barrel Zinc Plating" – Unistrut Corporation – *Iron Age* – "Continuous Flow Automatic Barrel Washing, Zinc and Cadmium Plating" at Shakeproof, Inc., division of Illinois Tool Works – *Steel.*

And the design features of the new "Stevadoer" that were the basis for the *Modern Design* award presented to Frederic B. Stevens, Inc.

Write for your copies today.

NEW MERCHANDISING SERVICE FOR PRODUCTION PLATERS

• • •

Does your company promote to customers the fact that you have modern automatic equipment for electroplating in your plant? Do you tell them that your equipment insures better metal finishes at closer tolerances?

If you believe such promotion will be helpful, and if you now own or are preparing to purchase Stevens automatic equipment, Stevens is prepared to assist you in such mailings.

TO SERVE YOU BETTER
TO SERVE YOU BETTER
The John Doe Plating & Processing Co.
Wishes to advise you of the installation of a STEVENS Automatic Plating Machine

Illustrated above is a two-color mailer which we will furnish to you *without charge*. It will contain an imprint of your company name and an illustration of the Stevens automatic plating machine you have installed. All you need do is furnish us with a photograph of the Stevens machine and your correct company name and we will imprint and ship the quantity you desire all ready for proper addressing.

This type of advertising tells your customers that you have the finest equipment available. That you can make fast delivery of quality plated parts—that plating thicknesses are uniform—that the work is done automatically with exacting timing. The human element is eliminated.

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PLATING . . .

Art or Science?

By A. H. DU ROSE†

Introduction

We have frequently heard plating referred to as an art, and in many cases this is not meant as a compliment. The opinion is that plating involves only rule-of-thumb, trial-and-error or empirical methods and formulations. We find this attitude among people in professional, managerial and production fields who are only indirectly connected with plating. Sometimes even more derogatorily the term black magic has been used.

Definitions

Some of us like to think of plating as a science and resent the term art being applied. When such a question arises the logical procedure is to turn to definitions of some of the terms involved. Doing this, we find little reason to object to the term art applied to plating. The following are some selected definitions from Webster:

Science—Any branch of systematized knowledge.

Scientific (Method)—

a) Yielding knowledge deductively.

b) Practicing thoroughness or systematic methods.

c) Applying expert knowledge.

Empirical—Dependent upon experience or observation alone.

Art—Systematic application of knowledge or skill in effecting a desired result.

"A science teaches us to know; an art to do."

When these definitions are considered there is no reason why plating should not be considered an art. In other words, the art of plating can be said to be the systematic application of the science of plating. Of course there are large gaps in the science of plating that might be called unsystematized. This is because of lack of knowledge concerning certain phenomena, and we can't be criticized for this any more than other fields of endeavor.

† Mgr. Plating Development, Harshaw Chemical Co., Cleveland, Ohio.

The first definition under "scientific" would be the ideal. In other words, if our knowledge were complete enough we could "armchair" all of the answers. It isn't believed this has ever been done although certain aspects of atomic energy development came close to it. The story is told, I believe of Edison, that in interviewing applicants for new positions he would hand them a light bulb and ask how to get the volume of it. Some would go into laborious mathematical procedures while others suggested the water displacement experimental method. We can imagine who got the job. Those in the consulting business today are frequently asked questions, the answers to which could be determined more quickly by a few experimental modifications in the production line.

In spite of definitions, however, we have to admit that much in plating is rule-of-thumb and empirical; that we do many things without really knowing the reason why. Much of our research and even some production is done by trial and error methods. It is desirable to emphasize that the same applies to any branch of science which is put to a practical use. The process or product may later be improved by application of theory, but with very few exceptions the practice precedes the theory. The patent office is gradually getting away from the concept of "flash of genius" but it is still a factor in potential inventions in that it sometimes seems easier to have a patent allowed if one can describe a so-called "unexpected result" rather than to arrive at an invention by a process of systematic reasoning.

Other Industries

The practice precedes the theory not only in plating but also in other branches of science put to a useful application. As examples, some of the problems in other branches may be briefly considered:

Ceramics—There is still no clear-cut and universally accepted theory on adhesion of ceramics to metals. It was found that a dip in a nickel solution helped and that nickel metal was actually deposited on the steel by displacement. A more continuous coating of nickel is harmful. Even the present day theories explaining this came after the practice was in effect.

In the field of ceramics, it is known that certain chemicals impart certain colors but it is impossible to calculate in advance how to obtain certain shades. Even after formulations have been developed for given shades, it is frequent that a little "doctoring" of each batch is necessary. Trace quantities of certain compounds have a large effect.

Metallurgy—The properties of individual metals may be known, but mixtures of these metals frequently give unexpected results. Trace quantities of metals are widely used in alloys and the effects usually determined or discovered by trial and error methods. The methods of testing are very important.

Plastics—Stabilizers are used in plastics to prevent darkening and/or brittleness. It is known that the aging effects in the case of PVC are caused by dehydrochlorination which in turn acts to catalyze additional degradation. A logical remedy or scientific approach might be to add an amine which would tie up the acid. Actually it is found that the most logical amines don't function as well as some less logical materials.

Fuels—Starting with tetraethyl lead most of the developments in gasoline have been the result of trial and error testing. The test method is important and there seems to be considerable disagreement in this industry today on the results or interpretation of the results.

Notice that in these various industries much of the work going on involves "trace quantities" and that for the most part the developments are by empirical methods. Notice also, and this is important, that adequate methods of testing are required and that the correct interpretations of the test results are just as important. This is the reason statistical methods are coming into more prominent use.

Therefore, while much of the future progress in plating will be accomplished by trial and error methods as in the past, it is important to keep in mind that the work can be systematic and that every effort should be taken to correctly interpret the results. A simple example of the latter is the commonly accepted thought that chromic acid and sodium hydroxide are more difficult to rinse from metal parts than other solutions such as acids and nickel solutions. There is good evidence to indicate that this is a misconception due to the intense color of chromic acid and the "feel" of sodium hydroxide solutions and that the really important factor is agitation. Too often we are inclined to come to a definite conclusion on the basis of certain results whereas statistical methods or just intellectual honesty would lead us to the more correct conclusion that we still do not know the answer and that additional work is needed.

Summarizing, we have tried to show that:

1. There is nothing wrong with the empirical method if it follows a systematic procedure.
2. Adequate methods of testing are essential.
3. Results should be correctly interpreted keeping in mind that it is better to admit we don't know the answer than to draw an incorrect conclusion.

Problems in Plating

With the above points in mind let us briefly look at some of the past and present problems in plating.

Basic Formulations—At one time or another work was necessary to determine a suitable bath composition and arrive at what we now call a standard or workable formulation for all the common plating solutions. Today we may have a general idea of why we use a certain formulation, but certainly most of the original work was by the trial and error method. Even with our present day knowledge, it is not conceivable that someone could calculate in advance how much free cyanide a copper solution should have to obtain the best results.

Mechanism of Deposition—We don't yet know exactly how a metal ion eventually becomes part of the electrodeposit. It might not be important to know from the present day practical standpoint but before long a better understanding of this mechanism will be needed before further progress can be made.

Current Distribution—Even the best mathematicians can solve only the most simple cases. It is much quicker to get answers in throwing power by experimentation than by calculation.

Cause and Effect of Polarization—This enters into many plating problems. Both the cause and effect are of interest and if fully understood might clear the way for more rapid progress. However, practical or useful progress will be made in spite of this lack of knowledge. The cause might be more important than the effect. There have been attempts to explain bright plating and leveling on the basis of polarization. This is because polarization almost always accompanies these phenomena. However it might be that brightness and polarization are both the result of some common primary and more fundamental mechanism.

Porosity—This certainly is one of the important problems facing the plating industry today. Even a good method of accelerated testing would help. We should not expect too much from an accelerated test, however, when there is still a question on the reliability of our outdoor exposure tests as compared to actual service. This is even more confusing when it is remembered that different outdoor atmospheres have different effects on different electrodeposits. A good example is the effect of New York and rural atmospheres on nickel and lead deposits. Table I shows the effect of New York and State College atmospheres on these two deposits. Notice that lead is much better at New York than at State College whereas the reverse is true for nickel. This table also demonstrates a problem in reproducibility.

Reproducibility—This is probably the most important, most bothersome problem facing plating, both production and research, today. It is likely that more than 50 per cent of the time spent in research is in trying to get reproducible results from the standpoint of time, location, apparatus or experimenter. This problem is doubly important because of the tendency to disregard it; to think that the work done and the conclusions arrived at are beyond question. Frequently, the conclusions are correct —but only for the particular situation, circumstances or set of variables. It may be that plating is worse than some industries in this respect because so many variables are involved. We have all seen cases where two shops are attempting to do the same thing under supposedly the same conditions and one is succeeding and the other is not. When we consider all the possible variables both known and unknown, controlled and uncontrolled, we can understand and expect different and sometimes incongruous results. In the simple plating cycle of cleaning, rinsing, acid dipping, rinsing and plating, we have several controllable variables in each step, not counting the variables of time and atmosphere which operate during each transfer step. If there is interaction between these variables, it is understandable why inconsistent results are frequent. Correlation between a given variable and the overall results too frequently neglects the other factors involved. Some use the same kind of reasoning that school teachers are heavy drinkers because there is good correlation between teachers' salaries and sale of alcoholic beverages.

Some may be inclined to think that inconsistent results only happen to others. It should be remembered however that even if reproducible results are obtainable in one place at different times they may not be reproducible in two places. This is probably due to variables which are unknown or thought to be unimportant. Quite often the results are legitimate but the conclusions questionable or of too wide scope.

The following are some examples of inconsistencies and poor reproducibility in the field of plating:

Table I, in addition to showing the reverse effect of different atmospheres on different coatings, demonstrates a lack of consistency in judging and rating corrosion.

Table I

PER CENT DEFECTIVE (OR RUSTED FOR LEAD) AREA ON NICKEL AND LEAD DEPOSITS

(ASTM; B-8, Sub. II—Outdoor Exposure Tests)

	New York	State College
1 mil Pb on steel (10 years)...	0%	98%
1 mil Ni on steel (3.5 years)...	50–100%	10%
1 mil Ni on steel (5 years)....	20%	2%

Note that for nickel the panels would appear to be in better condition from the data at 5 years than at 3.5 years. This can be explained in three ways:

1. During this period there was a change in opinion as to the relative importance of certain defects.
2. Rain just preceding the 5 year inspection may have made the panels look better.
3. General lack of reproducibility in rating the panels both with respect to persons doing the rating and to time.

It might be noted that regardless of this lack of reproducibility with time, the ratings are consistent with respect to the corrosion site. This is a good argument in favor of the use of "standards" in any type of corrosion testing. The standards can be internal; that is, more than one variety of coating tested simultaneously and conclusions drawn only on the relative results; not on a comparison with some previous results. Corrosion testing of production parts or processes without the adequate simultaneous testing of standards or other parts or processes is likely to lead to highly questionable conclusions.

Table II demonstrates lack of reproducibility of analyses results with which we are all familiar. These are on the same sample of nickel solution but at different times. One can suppose that the discrepancy is due to settling out of impurities and that the first sample was taken without shaking the solution and the second after shaking. Even some of these impurities, which one would expect to be perfectly soluble, have evidently been occluded on the iron and silicon precipitates. Both analyses may be correct but the sampling in error.

The effect of copper as an impurity in nickel solutions on corrosion protection has long been a question among platers. Table III summarizes some results of the past

Table II

DUPLICATE IMPURITY ANALYSES RESULTS

	Cr	Cu	Fe	Ca	Mn	Al	Si	Pb	Mg
First....	3	1	8	<500	25	25	50	1	300
Second..	5	1	60	<500	50	50	150	<1	400

Table III

EFFECT OF COPPER IMPURITY IN NICKEL SOLUTIONS

A.E.S. Project No. 5

40 ppm of Cu reduced salt spray time.....50%
10 ppm of Cu reduced salt spray time.....30%

ASTM; B-8; Sub II—Program 2

25 ppm of Cu "apparently has a negligible effect" on outdoor corrosion protection.

Bumper (Perflow) Committee

10 ppm of Cu had negligible effect on outdoor corrosion protection discounting blisters. (About 20% of the panels developed blisters.)

10 ppm of Cu had a slight harmful effect on salt spray life.

Table IV

NICKEL-CHROME VS COPPER-NICKEL-CHROME DEPOSITS

ASTM; B-8; Sub II—Outdoor Exposure Tests

Program No. 1—Copper thickness is of no value (in most cases)

Program No. 2—Copper thickness is of value (in most cases)

Program No. 3—Copper thickness is of value (tentative)

Table V

EFFECT OF COPPER FLASH AND ANODIC ETCH ON CORROSION PROTECTION

(Outdoors 3 weeks plus salt spray 7 hours—2 cycles)

	Bright Nickel on B.S. and C.R. steel	Bright Nickel on B.S. only	Perflow on B.S. only
Etch helpful.....	0 times	0 times	0 times
Etch harmful.....	8 "	8 "	3 "
No difference.....	9 "	10 "	7 "
Cu flash helpful...	8 (Cu flash gave more uniformity between replicates)		
Cu flash harmful..	2		
No difference.....	18		

few years. These results still leave some degree of uncertainty but show that possibly some of the discrepancies might be due to the method of testing, and to some extent to the plating procedure.

Another source of disagreement in the past (and future) is the relative values of nickel-chrome and copper-nickel-chrome deposits. Table IV gives some of the conclusions from three ASTM programs designed to answer this question. Obviously we still don't know the answer. Each of these sets of panels were plated in different laboratories at different times and under slightly different conditions. Possibly these different conditions are more important than was originally thought or there are other unrecognized conditions in the plating cycle which are of extreme importance.

The writer is of the opinion that an anodic etch in strong sulfuric acid on bumper stock steel is helpful in obtaining better and more uniform corrosion protection by nickel-chrome deposits. Table V showing results from the writer's own laboratory does not substantiate this. Each "time" represents a set of two to five panels. In spite of this, there is still good production evidence that the anodic etch is beneficial. Other variables operating can frequently mask or confuse the effect of one variable being studied.

The standard (20 per cent) salt spray test has come into disrepute in the past few years. This is not necessarily because it does not coincide with outdoor service conditions but mostly because of poor reproducibility. Table VI, in which the writer has taken the liberty of simplifying some of the original data, is an example. The laboratory number refers to the place of salt spray testing and the plater refers to a source of the plated panels. Notice that three kinds of information are available from this table. The vertical data under each plater gives the reproducibility between salt spray cabinets; the horizontal data (neglecting the range) opposite each test laboratory is an indication of plating reproducibility between platers; and the range (e.g. 8–18, 0–2, etc.) gives an indication of a combination of both reproducibility of the same cabinet at different times and reproducibility between panels prepared by the same plater. A statistician could get more exact information and conclusions from such data; but, if the test were to be repeated, it is likely that different data would result.

It is thought by the writer that too often platers are guilty of drawing conclusions from averages. Figs. 1 and 2 are illustrative of what is sometimes done. Fig. 1 gives the averages only, of sets of 5 panels exposed at Kure Beach. If we consider lot No.'s 5 and 6, it might be said that lot 5 is better than lot 6 in that lot 5 has an average rating of 6 and lot 6 an average rating of 4. However, Fig. 2 not only shows the averages but also the confidence limits (5 per cent level) of those averages. Statistically, this means that 95 times out of 100 the average would lie within these limits if there were a large number of panels. This in itself demonstrates that it is impossible to say that lot 5 is better than lot 6 since the true averages might be in reverse positions. By another statistical technique, it is possible to calculate whether there is a real difference between two sets of data. It is a fortunate coincidence

Table VI

SALT SPRAY TEST ON 0.75 MIL NICKEL ON 1010 STEEL

(ASTM; B-8; Sub III; Section B; 1954)
Range of Number of Rust Spots in 48 Hours on 3 or 4 Panels

Lab	Plater 1	Plater 2	Plater 3	Plater 6
I	8–18	9–22	15–25	0–14
II	0– 2	0– 3	0– 1	0–18
III	0– 2	4–31	1–11	0–21
IV	0– 7	8–10	0– 1	0– 9

when five panels are used and the "confidence set at 95 per cent," that if one of the confidence limits of one set of data does not overlap the average of another set of data then the averages can be said to be different. For example, lot 5 cannot be said to be better than lot 6 but lot 4NA can be said to be better than lot 6.

This method (t test) of comparison of averages is only absolutely correct when the two sets of data don't have widely different variances (a measure of spread or range of data). For instance, it is questionable whether the data of lot 10 should be compared with that of lot 11. However, it is of interest and importance that using rating numbers which are related to the logarithm of the per cent area defective instead of to the actual per cent area defective, statistical comparisons are more reliable. For example, if we compare the spread of confidence limits of lot 4NA (9.8—5 = 4.8) with lot 6 (6.2—1.8 = 4.4), the difference isn't great and the t test can be used. However, if the per cent defective area is considered, lot 4NA has a range from 0.05 per cent to 2.0 per cent and lot 6 a range from 0.9 per cent to 25 per cent. This is characteristic of corrosion data—the more the corrosion the wider the spread between replicates. Usually the use of the logarithm of the per cent rust will make for less numerical spread.

Conclusion

We have attempted to show that the term "art" can correctly be applied to the field of plating. However, to some extent this word is used because of our incomplete knowledge of the fundamentals affecting electrodeposition and also because of some inconsistency and lack of reproducibility in our results. The same applies to other industries to a greater or lesser extent.

Those in managerial positions usually like to be given a definite answer to a problem or question. Consequently there is a tendency to give them a definite answer when in all honesty a qualified statement would give a more accurate representation of the facts. When the true facts become evident the reputation of the plater suffers. It is to be expected that with the inevitable increase in practical and fundamental knowledge, we will be able to make more positive statements; but, until that time, considerable confusion can result from conclusions based on insufficient data. Results should be reproducible with respect to time, place and other variables.

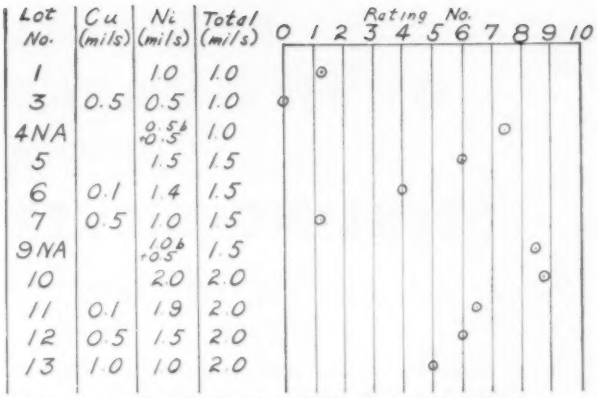
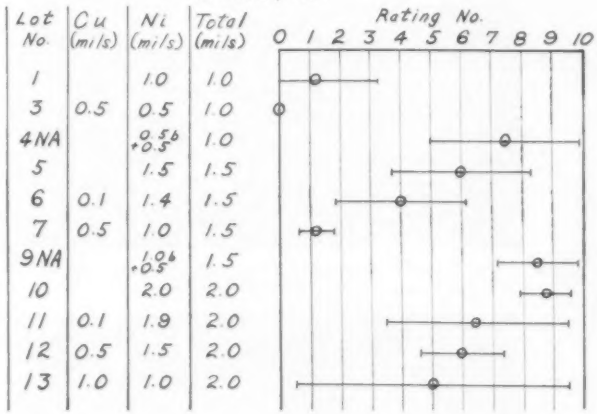


Fig. 1. Rating Averages for Outdoor Exposure Panels. ASTM; B-8; Sub II; Program No. 1, Kure Beach, 1951

Fig. 2. Confidence Limits of Rating Averages for Outdoor Exposure Panels. ASTM; B-8; Sub II; Program No. 1; Kure Beach, 1951



A. H. DuRose

A. H. DuRose is Manager—Plating Development at Harshaw Chemical Company.

His academic career includes studying at Michigan State and University of Cincinnati obtaining a BS and MS degree, respectively.

Art has been a member of the AES since 1942 serving in the capacities of Assistant Librarian, Branch Second Vice-President, Project No. 7 committee, and is presently serving on the AES Research Board.

In addition to these affiliations, Art is a member of the ACS, ASTM, Electrochemical Society, Tau Beta Pi and Phi Kappa Phi.

REMOVAL OF FIRE MARKS FROM STERLING SILVER

By F. A. Mohrnheim†

ABSTRACT

The characteristics and properties of "Fire" in sterling silver are described and illustrated in photomicrographs.

Methods for the removal of fire marks are compiled and formulated.

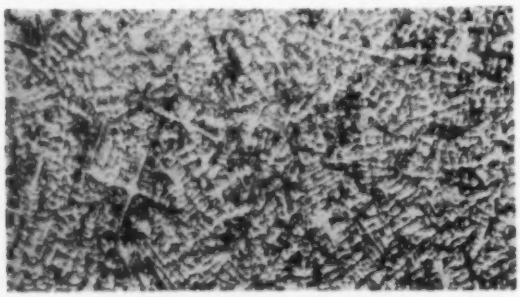


Fig. 1. Photomicrograph of sterling silver as cast and quenched from red heat—75X

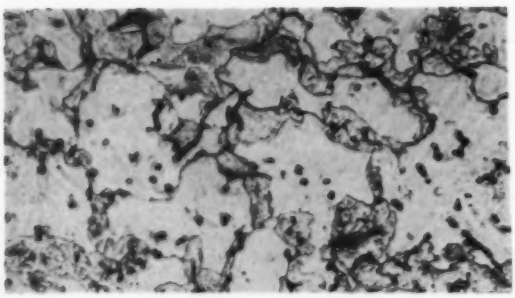


Fig. 2. Same as Fig. 1—250X

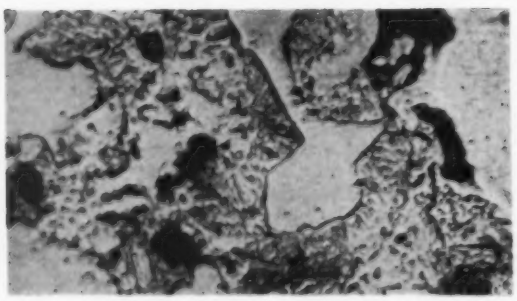


Fig. 3. Same as Fig. 1—1,500X

Scope

To the writer's knowledge, there is no comprehensive information in literature pertaining to the various methods for the removal of "fire marks" or simply "fire" from sterling silver articles which have been annealed or brazed under atmospheric conditions prior to finishing. Often one or two methods are practiced successfully in the manufacturing of silver by skilled workers according to formulas inherited from others or found by trial and error. Recent production difficulties of a large user of sterling flat stock, which could be traced back by the author to the misunderstanding of the nature of "fire," seem to indicate that some explanation on "fire" and a compilation of effective means to remove it from finished products may be appropriate.

Metallic Structure of Sterling Silver

Since sterling silver usually contains 7½ per cent copper, not all of which is in solution in silver, after the normal annealing treatment, the silver alloy is duplex with small amounts of the copper rich phase scattered through the silver rich matrix.[1]

Fig. 1 shows a photomicrograph at 75 fold magnification of sterling silver as cast and quenched in water from red hot heat. The crystals are characterized by a tree-like pattern composed of many branches, dendrites, also termed "pine tree" crystals. Fig. 2 shows the same specimen at 250 fold magnification. The bright areas are silver rich solid solution; the grey areas show crystals in which the copper constituent precipitated from the super saturated solution during solidification. Fig. 3, at 1500 fold magnification (oil immersion), shows a close up of Fig. 1 where, in this case, the precipitation (aging) appears to be of a microscopic heterogeneous type, i.e., advancing from the grain boundaries towards the center of the grain.

The photomicrographs named above, however, are little or not representative for most of the sterling silver after cold working and recrystallization during commercial annealing conditions. Fig. 4, at 250 fold magnification, shows cold rolled sterling silver (sheet, 0.050 inch thick) longitudinally sectioned in rolling direction after annealing 20 minutes at 1200° F. The copper rich grains (dark constituent) are embedded in the silver rich matrix in parallel lines indicating the rolling direction.

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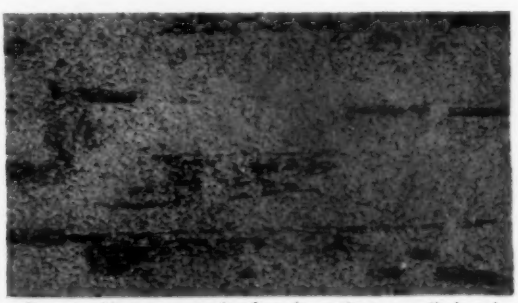

Fig. 4. Photomicrograph of sterling silver as rolled and customarily annealed—250X

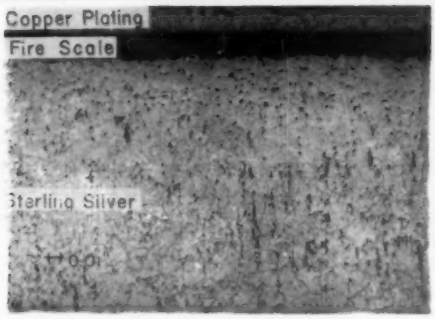

Fig. 5. Photomicrograph of edge of sterling silver as annealed 1 hour at 1200°F in air, showing black layer of oxide (fire scale) with copper plating on top for surface protection—100X

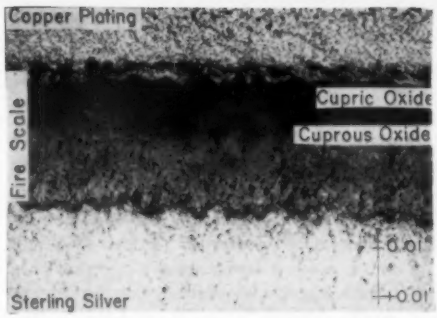

Fig. 6. As Fig. 5 showing taper section—100X—in vertical direction by taper—4X

Nature of Fire

When sterling silver is exposed to air at annealing temperature, a surface layer of copper oxide (annealing scale) will grow from the surface into the substratum forming the subscale, which will increase in thickness with time, temperature and the amount of oxygen available for oxidation. One hour of exposure to air at 1112° F (600° C) will oxidize sterling silver to a depth of 0.003 inch.[2] Fig. 5, (100x), shows in a transverse section the edge of sterling silver sheet (0.050 inch thick) which has been annealed 1 hour at 1200° F in a muffle furnace without protection against oxidation. A black surface film (Fire Scale) had been formed and was protected on top for the preparation of the metallographic specimen by an electrodeposited copper plating. It may be noted that the copper constituent in the sterling silver near the edge seems to be distributed at random and assumes orientation in the rolling direction only at a remote distance from the edge (vertical lines from the center to the bottom of the photomicrograph). The oxidation of copper to black cupric oxide (CuO), which may occur on the surface, is only one form of oxide. Another, namely red cuprous oxide (Cu_2O), is initially formed and will remain stable whenever oxygen is not in excess. Thus, underneath the black cupric oxide and in the subscale, red cuprous oxide will be present. Fig. 6 shows in a taper section[3] the different layers of copper oxide of which the fire scale is composed. While the optical magnification of the photomicrograph is 100 fold, the magnification in the vertical direction (depth of oxide layer), due to taper, is four times as much.

For further working the metal or finishing an article, the metallic surface of the silver has to be restored after annealing by removing the fire scale. Traces of oxide which are most protruded into the surface are prone to remain. When such metal is polished a dark sheen, known in the jewelry trade as "fire," will be observed.[4] Fire marks consist of off-colors, patches and streaks of a dark shade which are brought out during the final polishing and greatly impair the luster and brilliancy of the finished article.

Methods to Avoid "Fire" in Sterling Silver

In order to prevent or minimize the access of oxygen to the surface of sterling silver during annealing, three methods are suitable:

(1) Bright annealing in a protective furnace atmosphere or in a steam atmosphere;
(2) Annealing in a salt bath;
(3) Covering the surface with a protective annealing paint, such as boric acid or a commercial brazing flux—sometimes used with ochre.

Methods to Remove "Fire" from Sterling Silver

The removal of the coating of copper oxide produced by annealing the sterling silver under oxidizing conditions can be done by mechanical, chemical, anodic treatments or a reconditioning anneal under reducing condition.

(1) **The mechanical removal** includes blasting, grinding and polishing. Since these treatments remove not only the copper oxide but simultaneously all silver of the surface, and, in addition are time consuming, they are usually not considered practicable.

(2) **The chemical treatments** may be either acid (dips or pickles) or alkaline (bleaches).

(a) Nitric Acid Pickle

Dipping the article for less than one minute in a cold solution of one part nitric acid, (40 Baumé, technical), and one part water, is very effective. A ratio of two parts nitric acid with one part water is also successfully used. Another method using nitric acid is one part of the latter and six parts of water which is, in workshop practice, kept in a stock jar of glazed earthenware or glass. The required quantity for the latter pickling treatment is transferred to a suitable "boil-pan" and heated to boiling. The article is then immersed in it and allowed to remain for a short time until the surface is clean. (All these operations must be carried out under a ventilating hood.) After this, the pickle is poured off and the article well rinsed, first in cold and then in hot water to completely remove the acid and for subsequent quick drying in heated sawdust.

(b) Sulfuric Acid Pickle

Hot sulfuric acid pickle is largely used for cleaning the surface of silver and gold alloys after annealing. The acid content of this pickle may be said to vary from 5 per cent to 10 per cent by volume of oil of vitriol (sulfuric acid; 66 Baumé). Consequently, the specific gravity of an effective pickle should be maintained between 1.058 (8 Baumé) and 1.124 (16 Baumé). The usual pickle for sterling silver contains about 7 per cent by volume of oil of vitriol and shows a specific gravity of 1.082 (11 Baumé). Sulfuric acid is a less active solvent than nitric acid and is therefore safer to use and has, at this concentra-

tion, practically no action on nonoxidized sterling silver.

(c) Cyanide-Peroxide Dip (Bleach)

This alkaline dip, consisting of sodium or potassium cyanide dissolved in 10 times its weight of water, is often used instead of the acid dips, especially when it is essential that the original polish on the article should not be disturbed. The copper oxide is far less readily soluble in cyanide than in acid dips. To increase the attack and to shorten immersion time in this liquid, oxygen, mostly in the form of hydrogen peroxide solution, 30 per cent, is added shortly before use, which causes vigorous boiling action. The fumes from this bath are poisonous as well as disagreeable and the solution will not remain active long after the addition of the peroxide. A fine silver-like matte surface can be obtained from sterling if there isn't too much annealing scale present. In practice, this is done by using porcelain casseroles (approx. 17½ inches diam. x 6 inches high) under a hood with draft. To two quarts of sodium cyanide, 10 per cent, approximately 3 fluid ounces of hydrogen peroxide, 30 per cent are added. Since the boiling and agitation of the silver causes overflow, it is advisable to have drainage pipes made of lead and to have zinc shavings in a drainage trap in order to reclaim the silver when bleaching is done as a routine operation.

In place of the mixture of potassium cyanide and hydrogen peroxide, a mixture of equal volumes of 10 per cent ammonium persulfate in water with 10 per cent KCN, as it was first suggested for a metallographic etch by E. M. Wise,[1] may be used for a few minutes.

(d) Surface Finishing Cycles

In finishing small metal parts of precious metals in the jewelry trade and related industries, it is customary to use cycles of surface cleaning procedures which include pickles and bleaches. These processes not only remove fire, but give particularly bright surfaces and are therefore of general interest. One typical cycle found by the author to work well is formulated as follows:

1) Dip in hot sulfuric pickle (H_2SO_4, 10 per cent by volume.)
2) Dip in nitric acid pickle (1 part HNO_3, 40° Bé, technical to 1 part of water)
3) Water dip and rinse
4) Dip in sodium cyanide-hydrogen peroxide mixture
   Sodium cyanide (NaCN) 0.5 oz/gal (3.8 g/l)
   Hydrogen peroxide, (30 per cent H_2O_2) 2 fl oz/gal (15 cc/l). This solution must be used within a few minutes after being made.
5) Dip in cyanide solution (NaCN) 3 oz/gal (22 g/l)
6) Tubbing in ammoniated pig soap solution.

Another procedure mentioned by P. H. Margulies[3] is the following:

1) Preliminary pickle
2) Immersion for a few minutes at room temperature in a solution containg sodium cyanide and hydrogen peroxide, e.g.
   Water . . . . . 3.5 gal
   Sodium cyanide . . . . . 6 oz by weight
   Hydrogen peroxide . . . . (35 per cent) 700 ml
3) Standard cyanide dip
4) Dip in a solution containing sodium perborate or equivalent hydrogen peroxide and sodium metaborate, and sodium cyanide e.g.
   Water . . . . . 3.5 gal
   Sodium perborate . . . . . 4 oz by weight
   Sodium cyanide . . . . . 2 oz by weight

(3) Anodic Treatment

Electropickling of sterling silver is not described in the literature as far as the writer knows. Following the general principles and methods broadly used for steel and nonferrous alloys, there should be no difficulty to apply the sulfuric acid pickle at not over 80° F for one minute with current density of approximately 100 amp/sq ft where the article is made the anode. Another operation widely practiced by electroplaters and known as stripping can be used. It removes the surface containing fire from the solid sterling silver basis by partially dissolving the metal anodically in a bath solution, at room temperature, of sodium cyanide 12 oz/gal, sodium hydroxide 2 oz/gal at 2 to 6 volts using steel cathodes.[6]

(4) Reconditioning Anneal Under Reducing Conditions

When only a slight amount of fire is present, the copper oxide at the surface can be reduced in a subsequent anneal either in a reducing salt bath (flux) or in a reducing atmosphere. However, experience has proven that a'terat on of oxidizing and reducing atmosphere can be very damaging and therefore the latter is not recommended. (Even pure silver will dissolve enough oxygen to be damaged by subsequent heating in hydrogen.) Any hydrogen that may be present in the reducing gases to which the metal is exposed in annealing may lead to the formation of water vapor by interaction of the hydrogen and the copper oxide and produces blisters. For this reason heating in carbon oxide (CO), for example, heating in a pot containing charcoal may be useful. The charcoal must be heated prior to use to drive off any moisture.

Cautions

For economic reasons, annealing of finished articles of sterling silver should always be carried out in a minimum of time and at a minimum of temperature; a period of 20 minutes at 1175 to 1200° F is mostly used and considered to be practical and sufficient for further working the metal. An annealing temperature beyond 1435° F (Eutectic temperature) where the copper rich phase becomes liquid, must be avoided.

In any of these treating operations, care must be taken to separate the pieces of silver to avoid welding together.

It must be pointed out that the red cuprous oxide under-

neath the black surface has different chemical properties and is, e.g., far less soluble in hot diluted sulfuric acid than the black cupric oxide. If sterling silver is excessively overheated in an oxidizing atmosphere, the oxidized zone will be increased considerably. When such stock is pickled insufficiently, the black oxide at the surface may dissolve completely leaving part of the red oxide underneath. This condition cannot be detected when the surface is visually inspected and may or may not cause trouble at a later stage when the stock is further reduced in thickness in the course of production.

Thus, it is quite possible that stock from one ingot when finished at a thick gauge may not show any evidence of previous faulty treatment, while the same stock finished at a thin gauge may reveal fire in the substratum if the shallow silver enriched surface layer is penetrated by the finishing tools.

If articles manufactured from faulty stock are polished in a final polishing operation, the polishing wheel may cut through the apparently faultless surface and hit the remaining hard cuprous oxide subscale, causing polishing marks. In order to restore a flawless surface, heavy polishing or perhaps grinding will be necessary to penetrate to the oxide-free silver basis metal.

Consideration

A point which has to be considered in connection with chemical and electrochemical treatments is the alteration in the composition of the surface of sterling silver because the copper, originally present there, has been oxidized during annealing and removed by pickling. Little or no copper diffuses from the interior, during annealing, to replace that which has oxidized and when the copper oxide is pickled a porous matte silver surface remains. Many silver workers rely to a certain extent on the white matte "blanched" surface, especially when hammering or engraving is involved in production methods since tool marks are not so readily seen on the darker surface containing copper. Also, the fine silver coating is softer, and, therefore, easier to work. On the other hand, it is said, that much of the esthetic appearance of antique silver is due to the fact that in former times, after annealing, the articles could only be handpolished, a procedure which preserved most of the fire in the surface.

It may be of interest to point out a certain similarity between the fine silver coating on sterling silver and the rim of relatively pure ferrite on cold rolled rimming steel.[7] The metal finisher or electroplater who is only concerned with the surface property of his material has to realize that he is actually not dealing with sterling silver or low carbon steel, but with pure metals and that underneath this pure surface a thin zone of oxides or inclusions may cause trouble when the upper surface is removed.

Silver annealed under nonoxidizing conditions is said to be "bright annealed" and is described as "fireless" or "fire free" to distinguish it from stock produced under ordinary conditions and exposed to oxidation. Silver annealed under nonoxidizing conditions requires little or no pickling since there is practically no copper oxide to remove and the composition of the surface remains thus unaltered, i.e., the one of sterling silver. By improper heat treatment in the course of final manufacturing steps, the silver guaranteed to be "fire free" can more readily be made to produce fire marks and becomes much blacker than ordinary sterling silver, which possesses the thin protective fine silver coating previously described.

Semifinished stock of sterling silver as customarily produced may be considered reasonably free of fire. Traces of fire which remained due to commercial production methods are usually taken care of by the customer, or removed by the producer at additional cost by methods described above. As to the question whether semifinished stock of sterling silver should be completely free of fire, it should be considered whether during the manufacturing of an article further annealing or brazing operations will be necessary. Since commercial brazing, as it is frequently done by the blowtorch or open flame, produces almost unavoidably copper oxide (fire) at the surface, the articles must be cleaned after brazing. In this case small amounts of annealing scale, previously present in the semifinished stock, will be simultaneously removed and therefore, may not be considered as objectionable. However, when there is no fire treatment involved in fabricating an article, the customer should expect to receive flat-stock or wire which is completely free from fire.

ACKNOWLEDGMENT

The writer is indebted to Messrs. Leach and Garner for inspiring and encouraging this paper. Thanks are due to E. M. Wise of The International Nickel Co., whose suggestions contributed greatly to clarify the subject, to my colleague, J. Doescher for fruitful discussions and to my two assistants, Mrs. D. Keane, who prepared the specimens, and J. Stanley, who cooperated in chemical testing and preparation of the article.

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[2]Leach, R. H. and Chatfield, C. H. "Manufacture of Sterling Silver and Some of Its Physical Properties." Am. Inst. Min. Met. Eng. Inst. Met. Div. **78,** 743 (1928).

[3]Mohrnheim, F. A. and Westman, A. E. R. "AES Research Project No. 14—Taper Sectioning of Basis Metal Surfaces and Electrodeposits." Plating **41,** 9, 1043 (1954).

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[5]Margulies, P. H., "Surface Treatment of Metals with Peroxygen Compounds." Plating **42,** 5, 561 (1955).

[6]Metal Finishing Guidebook Directory 1954, Finishing Publications, Inc., Westwood, N. J., 408.

[7]Westman, A. E. R. and Mohrnheim, F. A., "AES Research Project No. 14—The Influence of the Physical Metallurgy and Mechanical Processing of the Basis Metal on Electroplating." Plating **42,** 2, 155 (1955).

Dr. F. A. Mohrnheim, P. Eng. recently Assistant Director of AES Research Project No. 14 of the Ontario Research Foundation, Toronto, Canada is now Head of the Metallurgy Department of Leach & Garner Company, manufacturers of Gold, Silver and Gold Filled Material in Attleboro, Massachusetts. He is a member of the AES, ASM, German Society for Metals (DGM), and the Association of Professional Engineers of the Province of Ontario.

Dr. Mohrnheim was graduated from the Technical University of Karlsruhe, Germany as chemist in 1939 and received his doctorate at the Kaiser Wilhelm Institute for Metal Research in Stuttgart, Germany in 1942.

PATENT ABSTRACTS

DR. D. GARDNER FOULKE
Manager, Electrochemical Development
Hanson-Van Winkle-Munning Co.
Matawan, New Jersey

Copies of patents may be obtained by writing to Commissioner of Patents, Washington, D. C. Price 25 cents each.

No. 2,721,834, October 25, 1955—Electroplating Method and Apparatus—F. Koury, assignor to Sylvania Electric Products, Inc.

A type of basket plating is described for small parts which are placed in a pan suspended in a plating bath in a solution container carrying anodes along the side, said pan connected to a vibrator, (1/16th inch and 120 cycles per second).

6 claims, 4 figures.

—AES—

No. 2,721,835, October 25, 1955—Surface Treatment of Aluminum—W. Axtell, assignor to Shivayder Bros., Inc., Denver, Colo.

The method consists of anodically treating aluminum articles in a solution of 0.27–1.5 per cent of chromic acid and 1.51–8.4 per cent of phosphoric acid at a pH of no more than 2.3, then removing without washing or drying and coating with an enamel or paint compatible with phosphoric acid.

The preferred composition is given as:

Phosphoric acid	1.68% by wt
Chromic acid	0.3 % " "
Water	Balance

10 claims.

—AES—

No. 2,721,836, October 25, 1955—Electrodeposition of Antimony—A. DuRose, assignor to the Harshaw Chemical Co., Elyria, Ohio.

The antimony plating solution consists of antimony trifluoride 0.3–0.9 mol/l, aliphatic alpha hydroxy carboxylic acid, 1/8–2 equivalent weights per atomic weight of antimony, and an alkaline compound to produce a pH of 2.5 to 5.0.

Example 4 is as follows:

SbF_3	1.25 mols/l
$(NH_4)_2S_4O$	1.25 " "
Glycolic acid	0.75 " "
NH_4OH to pH	4.0 " "

12 claims.

—AES—

No. 2,721,837, October 25, 1955—Anodizing of Metal Articles—J. Backer, assignor to Aero Zipp Fasteners, Ltd., London.

This anodizing method makes use of centrifugal force as a means of bringing metal articles in contact with the anode by placing said articles in an electrolytic cell which is rotated around an extraneous axis at high speed.

10 claims, 4 figures.

No. 2,721,838, October 25, 1955—Method of Electrolytically Pointing Wires—S. Visser, assignor to Hartford National Bank & Trust Co., Hartford, Conn., as trustee.

The method consists of uniting the end of the wire with a finely divided porous electrically insulating material insoluble in the electrolyte in which the wire is suspended as an anode. A current is passed until the end of the wire becomes pointed in the vicinity of the meniscus formed by the bath liquid about the wire.

5 claims, 3 figures.

—AES—

No. 2,721,839, October 15, 1955—Plating Apparatus for Electrical Rectifiers—H. Taylor, assignor to Westinghouse Air Brake Co., Wilmerding, Pa.

A fixture for holding plates in an electrolyte masking and providing for pumping the electrolyte over the exposed faces of the plates.

12 claims, figure.

—AES—

No. 2,721,426, October 25, 1955—Shaking Barrel Apparatus for Polishing or Cleaning Small Objects—C. Vincent, Birmingham, England.

A small burnishing barrel apparatus is described. The figure shows three oblique barrels with motor and drive designed to drive all simultaneously.

11 claims, figure.

—AES—

No. 2,722,513, November 1, 1955—Float Actuated Work Carrier—C. Clark, assignor to the Udylite Corporation, Detroit, Michigan.

A work carrier for solution trapping tubular members and the like is described which holds the work in the ideal position permitting escape of the gas and then when it is lifted out of the bath. This is accomplished by means of a pivotally mounted element for carrying the work piece, provided with a float to automatically empty.

2 claims, 12 figures.

—AES—

No. 2,722,508, November 1, 1955—Electrodeposition of Alloys Containing Copper and Tin—E. Heymann and G. Schmerling, London, England.

The electrolyte used to deposit copper-tin alloy deposits using anodes of copper (80–95 per cent) and tin (5–20 per cent) or copper and tin and up to 2.5 per cent aluminum or up to 2 per cent magnesium is claimed to be water solution of 5-25 per cent copper cyanide, 10–50 per cent sodium stannate, 10–35 per cent sodium cyanide, 3–5 per cent sodium hydroxide and 10–45 per cent sodium citrate.

Example 1 of five examples gives the bath as consisting of:

Copper cyanide	40 g/l
Sodium stannate	20
Sodium cyanide (total)	65
Sodium hydroxide	7½
Sodium citrate	50

7 claims.

—AES—

No. 2,722,509, November 1, 1955—Production of Titanium—E. Wainer, assignor to Horizons Titanium Corp., Princeton, N. J.

The method consists essentially of the electrolysis of a fused salt electrolyte containing alkali metal or alkaline earth halides and an alkali metal fluotitanate at 500–850° C under controlled atmosphere. While electrolyzing a solid solution of TiC and TiO is introduced into the fused salt bath.

14 claims.

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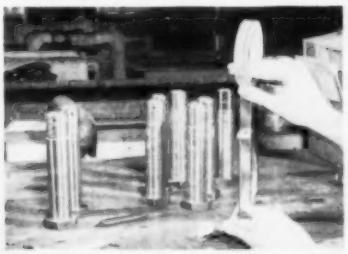
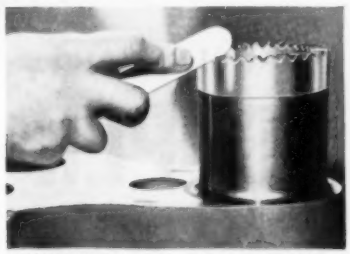
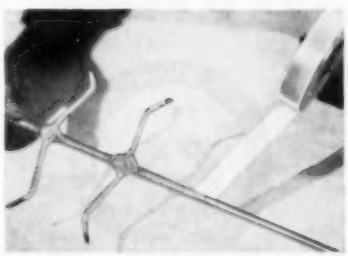


THINNESS of "SCOTCH" No. 850 Polyester Tape prevents edge build-up when used to mask bearing surfaces before plating.



ELIMINATE slow, costly wiring of lead sheets onto areas to be masked by using "SCOTCH" Brand Tape No. 420. Tape itself is lead foil with pressure-sensitive adhesive.



SAVE solutions . . . prevent build-up on racks by covering racks with heavy-duty "SCOTCH" Brand Plastic Tape No. 470. All "SCOTCH" Brand Tapes apply easily from roll.

ARTICLE REFERENCES

By
WILLIAM TUCKER
Eastman Kodak
Rochester, N.Y.

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17. CORROSION

a. *CORROSION IN THE MOTOR-CAR—BEARINGS AND EXHAUST VALVES*
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Corrosion Technology, Vol. 2, No. 11, November 1955, p. 334–338.

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Hugh P. Godard
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22. RECTIFICATION

a. *GERMANIUM—ELECTROPLATER'S HIDDEN TREASURE*
J. E. Pimental
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23. STRUCTURE

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a. *QUALITY TESTS FOR BLACK OXIDE COATINGS ON STEEL*
Jodie Doss
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25. THICKNESS

a. *A SIMPLE COULOMETER METHOD FOR TIN COATING DETERMINATION*
J. Monvoisin and M. Le Blanc
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26. TIN ALLOYS

a. *TIN ALLOY COATINGS AS ALTERNATIVES TO NICKEL-CHROMIUM*
S. C. Britton
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October 1955, Vol. 84, Part 2, p. 129–132

a. *INVESTIGATION OF THE CATHODE PROCESSES IN CHROMIUM PLATING*
A. I. Levin and A. I. Falicheva

b. *THE INFLUENCE OF SURFACE-ACTIVE AGENTS ON THE MECHANICAL PROPERTIES OF*

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ELECTROLYTIC COPPER DEPOSITS
Yu. S. Tsareva, V. G. Solokhina, N. T. Kudryavtsev and A. T. Vagramyan

c. *THE INFLUENCE OF SODIUM IONS ON THE ELECTRODEPOSITION OF COPPER*
R. M. Vasenin and S. V. Gorbachev

d. *THE INFLUENCE OF RUBIDIUM AND CESIUM IONS ON THE ELECTRODEPOSITION OF COPPER*
S. V. Gorbachev and R. M. Vasenin

e. *THE MECHANISM OF THE INFLUENCE OF ALKALI-METAL IONS ON THE ELECTRODEPOSITION OF COPPER*
R. M. Vasenin and S. V. Gorbachev

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November 1955, Vol. 84, Part 3, p. 211–212

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E. A. Ukshe and A. I. Levin

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N. A. Solov'ev

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I. E. Gurevich

* Below are listed the addresses of publishers where the reader may send for article references.

Corrosion
M & M Bldg.
Houston 2, Texas

Metal Finishing
381 Broadway
Westwood, N. J.

Metal Progress
7301 Euclid Ave.
Cleveland 3, Ohio

Products Finishing
431 Main St.
Cincinnati 2, Ohio

Tin Research Institute
492 W. 6th Ave.
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7	27	1.35	Methods for testing thickness of Electrodeposits, II & III	H. J. Read & F. R. Lorenz
6	28	0.85	Porosity of Electrodeposited metals	N. Thon, D. G. Kelemen, L. Yang, S. Yang, D. Dean
2	29	0.90	The Analysis of Electroplating Solutions for Major Constituents	E. J. Serfass, & M. H. Perry
14	30	1.10	Effect of Basis Metal Condition on Plating, Parts I & II	A. E. R. Westman F. A. Mohrnheim
4	31	0.45	Effect of Surface Finishing of Nonferrous Base Metals or Protective Value of Plated Coatings	G. J. Kahan, W. W. Macchia & J. M. Fairbank

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INTERSOCIETY NEWS

Report on Tech. Activities of ASTM Committee A5

By A. Mendizza, AES Liaison To ASTM Comm. A-5

Subcommittee VII—Methods of Testing

Magnetic methods for determining the thickness of zinc coatings have been investigated. A report on this work will be issued in the near future. Adverse comments on certain sections of specification A239-41 (Preece Test) dealing with supplementary tests—Microscopic test for Thickness and Water Immersion test—have been overruled by the members of this Subcommittee and the specification reaffirmed.

Subcommittee XII—Wire Specifications

Proposed Tentative Specifications for the following items have been prepared and are in various stages of completion.

a. Armor Wire
b. Zinc Coated Poultry Netting and Woven Steel Poultry Fencing
c. Farm Field and R.R. Right-of-Way Fencing (proposed revision of A116)
d. Barbed Wire (proposed revision of A121).

Also, a proposal has been made to restudy the provisions of Specification A117 on Chain Link Fence Fabric dealing with the omission of the Preece Test from this specification.

Subcommittee XIII—Hardware Specifications

New Specifications on galvanizing A 384-55T, A 385-55T and A 386-55T have been printed and are available for purchase. They will appear in 1955 Book of Standards.

Transmission Tower bolts specifications have been prepared by Subcommittee XXVI of Committee A-1 are being balloted in the committee. These specifications will contain a requirement of 1.25 oz average and 1 oz min. for individual bolts which is the same as in A 153 specifications of Committee A-5. Bolts with 2 oz. coating have been produced in several plants but the clause in tower bolt specifications of finger-free fit could not be met with this heavy coating.

New tests on tower steel angles are in progress and it is hoped they may shed some light on coating weights that may be obtained under favorable conditions of galvanizing.

It is also hoped that Preece test requirements may be deleted from A 153 when Subcommittee VII of Committee A-5 determines the accuracy of the various magnetic gages used for checking the zinc coating thickness on various types of steel.

Mendizza

Subcommittee XVI—Hardware Testing

A new Hardware Testing Program has been initiated and is now well under way. These Tests will include primarily Hot Dip Zinc and Aluminum coatings. Some electroplated zinc coatings will also be included. Several steels will be investigated, including some low alloy, high strength steels. The effect of shape of part and of cold working on the durability of these finishes will also be evaluated. Some 500 Specimens are involved in these tests. It is expected that the outdoor exposure tests will be started in the Spring or early Summer of 1956.

Subcommittees XI, XIV and XV on Sheet Specifications, Sheet Tests and Wire Tests, respectively, continue to be active on current problems. No new activities have been reported by these Subcommittees.

New Officers of American Standards Association

H. Thomas Hallowell, Jr., president, Standard Pressed Steel Company, Jenkintown, Pa., has been elected president of the American Standards Association, the directors of the Association have announced. He took office on January 1 for a one-year term.

Van H. Leichliter, vice-president of operations of American Steel and Wire Division of United States Steel Corporation, Cleveland, was elected vice-president of the Association.

Hallowell, has been associated with Standard Pressed Steel Company since his graduation from Swarthmore College in 1929. He became plant manager in 1943, vice-president and general manager in 1948, and president in 1951.

An economist and inventor as well as corporation head, Hallowell holds patents on a machine he designed for the automatic assembly of primer heads for artillery shells, and for other pieces of equipment used in manufacture of locknuts and socket cap screws. Hallowell received the 1953 Industrial Relations Achievement Award of the National Metal Trades Association for his company's outstanding employee relations program.

Leichliter became a metallurgist for American Steel and Wire on graduation from Penn State in 1930. In 1950 he was named assistant vice-president—operations, with headquarters at the Division's general offices in Cleveland. He became vice-president of operations in 1953.

Leichliter is a member of the American Iron and Steel Institute, American Society for Metals, Wire Association, American Ordnance Association, and the Association of Iron and Steel Engineers.

Elected as directors of ASA to serve three-year terms were: **H. E. Chesebrough,** executive engineer, Engineering Division, Chrysler Corp., Detroit, representing the Automobile Manufacturers Association; **Axel Jensen,** director of television research, Bell Telephone Laboratories, Murray Hill, N. J., representing the Society of Motion Picture and Television Engineers; **Dr. W. J. Sweeney,** vice-president, Esso Research and Engineering Co., New York, representing the American Petroleum Institute; and **A. E. Pringle, II,** vice-president, Pringle Electrical Manufacturing Co., Philadelphia, member-at-large.

R. M. Gates, president, Air Preheater Corp., New York, representing the American Society of Mechanical Engineers, was re-elected to the board.

ASME Names Auxiliary Papers Committee

Four editors of leading publications in the engineering design field have been named by the ASME as an auxiliary papers committee to draft a program for the four-day meeting.

They are Colin Carmichael, "Machine Design"; T. C. DuMond, "Materials and Methods"; George F. Nordenholt, "Product Engineering," and Frank J. Oliver, "Electrical Manufacturing."

The program will lay stress on the need for attracting new men to the field, training them, and making adequate provisions for rewarding outstanding achievements. Other subjects will include cost reduction as an important element in design, selection of engineering materials, and the effect of the trend toward miniaturization.

On the floor of the show, about 150 companies will exhibit components and materials which go into the making of end products. The top engineers of these suppliers of original equipment and materials will be in attendance at the booths to answer questions of visitors.

Top Exhibits at Tool Show to Display "Blue Ribbon" Awards

A new idea to spotlight the most significant developments in industrial exhibits will be a feature of the Tool Show, sponsored by the American Society of Tool Engineers, to be held March 19-23 at Chicago's International Amphitheatre.

Approximately 480 Blue Ribbons will be displayed on the outstanding productive equipment, automation, accessories, inspection and gaging devices, etc., that will be exhibited for the thousands of industrial executives, engineers and production supervisors who are planning to attend.

"An independent research organization's study of the last show indicates that nearly 30,000 show visitors spent an average of 2.2 days each viewing the thousands of products on display," says Harry E. Conrad, executive secretary of ASTE. "Even though this much time was spent, it was obviously impossible to look over every item in every display. Based on reports from over 70 per cent of exhibitors, more than 28,000 items will be on display in Chicago next March.

"With these factors in mind, we realized that it would be desirable to point out the outstanding 'high spots' of the show, particularly for the show visitor who has only a limited amount of time to see the many products on display. This has led to the development of the Blue Ribbon selections idea, which it is felt will make each visitor's time at the Tool Show more productive."

The Blue Ribbons will be distributed before the show opens so that every visitor will immediately be able to spot the latest tooling advances without any lost motion. Then each visitor will be able to spend his remaining time at the show going into further detail on the exhibits or items that are of special interest to him.

American Welding Society Show in Buffalo in May

The fourth Welding Show, sponsored by the American Welding Society, will be staged in the Memorial Auditorium, Buffalo, N. Y., May 9 to 11, it was announced by J. H. Humberstone, society president and president, of Air Reduction Sales Co., New York.

The exposition will be the largest ever held in the industry. It will exceed by one-third the size of exhibits at the Kansas City, Mo., show in 1955, and by 28 per cent, the record set when the show was last held in Buffalo in 1954.

All available space for displays has been assigned. One hundred companies will conduct exhibits.

Coincident with the show, the society will conduct its annual business meeting and a series of technical conferences. The metals engineering division of the American Society of Mechanical Engineers will, for the first time, join the American Welding Society in sponsorship of four sessions in which both groups have a mutual interest.

The welding committee of the Atomic Energy Commission also will co-sponsor a session.

Twenty-one technical sessions, with approximately 50 speakers are planned. An innovation this year will be a discussion of safety, health and fire prevention by the society's technical activities committee.

Other features planned include a Welding Conference, which will consider practical aspects of welding for industrial executives and a series of educational lectures for engineering students.

The show will feature more live demonstrations of welding processes and equipment than ever before attempted. Floor plans of exhibits have been altered to permit larger demonstration areas and a free flow of traffic to allow visitors to concentrate their interest on particular equipment.

Technical papers will be read, and business sessions of the society will be conducted, at the Hotel Statler. The Auditorium will be used for the exhibits, the educational lectures and the Welding Conference.

Advance registration forms and hotel information may be obtained by writing the American Welding Society, 33 West 39th St., New York 18, N. Y.

Design Engineering Conference

A conference to study industry's problems in design engineering has been announced by the machine design division of the American Society of Mechanical Engineers, sponsor of the event. It will be held at Convention Hall, Philadelphia, May 14-17, concurrently with the First Design Engineering Show.

ASTM B-8 Symposium

February 29, 1956—Buffalo, N. Y.

Committee B-8 of the American Society for Testing Materials announces a Symposium on Wednesday, February 29 at the Hotel Statler, Buffalo, N. Y. Eight papers will be presented at a morning and afternoon session.

Membership in ASTM is not required for admission. The Society is extending an invitation for attendance by all who are interested, with no registration fee involved.

Chairman of the symposium is Walter L. Pinner of Houdaille Industries, Inc., Detroit, Mich., and National Past President of the AES. Pinner is also chairman of committee ASTM B-8, Sub H on Performance Tests.

The program:

Morning Session: 9:30 A.M.

1. Introductory Remarks by the Chairman.
2. "History of ASTM Committee B-8," William Blum, Retired (formerly Director of Chemistry Section, National Bureau of Standards).
3. "Corrosion Behavior and Protective Value of Decorative Copper-Nickel-Chromium and Nickel-Chromium Coatings on Steel," C. H. Sample, International Nickel Company.
4. "Evaluation of Methods Available for Measurement of Surface Luster in Plated Coatings," Glade Bowman, Standard Steel Spring Division, Rockwell Spring and Axle Company.
5. "Metal Cleaning Prior to Electroplating," S. Spring, Pennsalt Manufacturing Company.

Adjournment for Luncheon

Afternoon Session: 2:00 P.M.

6. "Comparison of the Corrosion Behavior and Protective Value of Electro-deposited Zinc and Cadmium Coatings on Steel," C. H. Sample and R. B. Teel, International Nickel Company; and A. Mendizza, Bell Telephone Laboratories.
7. "Evaluation of Supplementary Conversion Coatings on Zinc and Cadmium," R. E. Harr, Western Electric Company.
8. "Atmospheric Exposure of Electroplated Lead Coatings on Steel," A. H. DuRose, Harshaw Chemical Company.
9. "The Standard Salt Spray Test—Is It a Valid Acceptance Test," A. Mendizza, Bell Telephone Laboratories.

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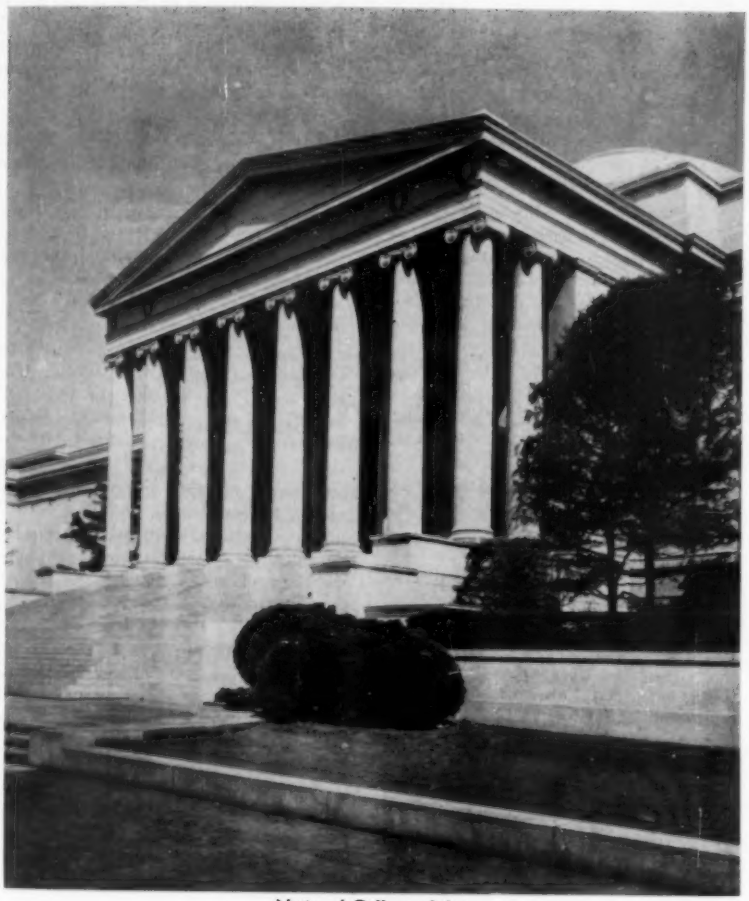

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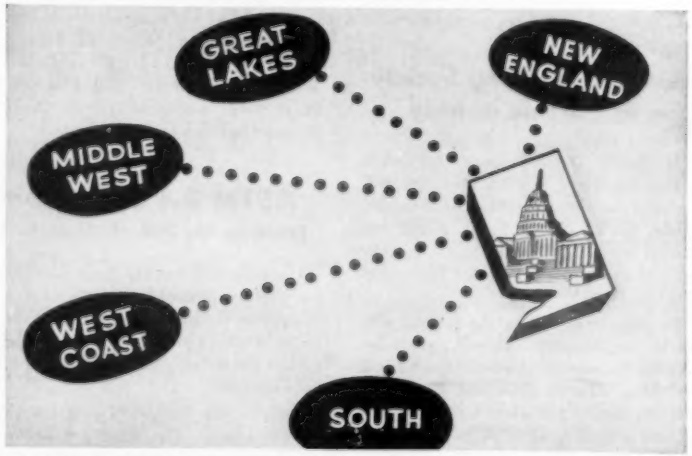

A Timely Message on

Are Presidents People?

by Ben P. Sax

President, American Buff Company

How would you like to attend a *different* party? You probably know companies who have had birthday parties for the oldest employee, or to honor someone who was elevated to a Cabinet post.

Recently, a good friend invited me to attend a most unusual party—a surprise party for his boss, the firm's president! It wasn't to celebrate his birthday, nor a business anniversary. It was a party to express honest affection for a grand man who had built his business "from scratch" by hard, intelligent labor and honest service.

It was an accolade of honor from his employees and associates, an effort to convey to him how much they admired him for what he had done—not only as an employer, but also as a friend and as a man.

In some ways, this job of being president is one of the loneliest in the world. To everyone below him in the organization, he is THE BOSS—to be feared in some cases, respected in others, and obeyed at all times. Over him are the board of directors and stockholders, ready to criticize if anything goes wrong, seldom willing to praise when things go right. Truly, he is "between the devil and the deep blue sea"!

We are all human beings—even presidents! The man who was honored at this party was extremely happy! For once in his life, he received a nice pat on the back . . . something that everyone likes, but that presidents seldom get.

So, I am in hearty agreement with the idea of a "surprise party" for presidents, if for no other reason than that they are human beings and welcome a little encouragement.

Sincerely,

Ben P. Sax

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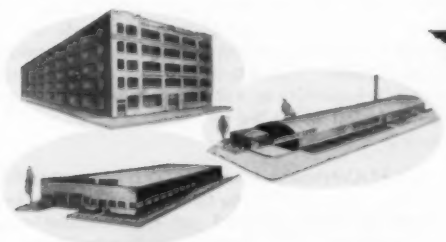

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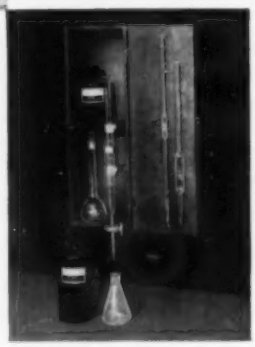

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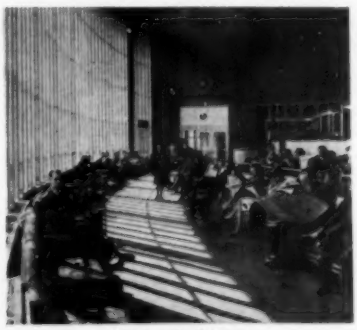

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Parkways, dual highways and first-class through routes, many new and improved, converge on the Washington Metropolitan area, making motoring toward the city a pleasure. Scenic roadways, picturesque bridges and stately monuments add beauty to the approaches, increasing interest until the city itself unfolds as an inspiring surprise. Throughout the year, travel by auto or chartered bus is impressive as well as convenient, with routes to the Nation's Capital unequalled by any other city.

BUS

The facilities of Greyhound Lines and Trailway, networked across the Nation, come directly to the center of the spacious downtown business, shopping, hotel and entertainment area.

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BALT.-WASH. NOTES

Transportation

AIRLINES
(Airport—Washington National Airport—three miles south of the city)

Allegheny Airlines
American Airlines
Capital Airlines
Colonial Airlines
Eastern Airlines
National Airlines
Northwest Airlines
Pan American Airlines
Trans World Airlines
United Airlines

Approximately 600 Arrivals and Departures Daily

RAILROADS
(Station—half mile from business district)

Atlantic Coast Lines
Baltimore and Ohio
Chesapeake and Ohio
Pennsylvania Railroad
Richmond, Fredericksburg & Potomac
Seaboard Air Line Railroad
Southern Railroad System

Daily Arrivals—Approximately 125
Daily Departures—Approximately 121

BUS LINES
(Terminal—In the heart of the business district)

GREYHOUND
Atlantic Greyhound Lines
Greyhound Lines
Pennsylvania Greyhound Lines
Capital

TRAILWAYS
Blue Ridge Lines
National Trailways Bus System
Virginia State Lines, Inc.
Richmond
Southern Maryland

Daily Arrivals—Approximately 150
Daily Departures—Approximately 150

STEAMSHIP LINES

Baltimore Steam Packet Company (Old Bayline)
Wilson Line Operating Company
United States Travel Agency

Department of Justice

Local

SURFACE—Capital Transit Company operates all surface carriers within the city. Charges for transportation compare more than favorably with other cities.

TAXICABS—Approximately ten thousand cabs available operated on an economical zone fare system. Average fare is 40c single or 30c when traveling with two or more.

MOTOR COACH—Interstate motor coach companies offer commuter service to neighboring cities and states.

SIGHTSEEING LINES—Finest type of sightseeing service available in the Nation's Capital.

PRIVATE FLYING FIELDS—In the Greater Washington area there are at least 7 flying fields offering complete services to the private and business flyer. All those fields are within minutes of the center of the city.

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Points of Interest

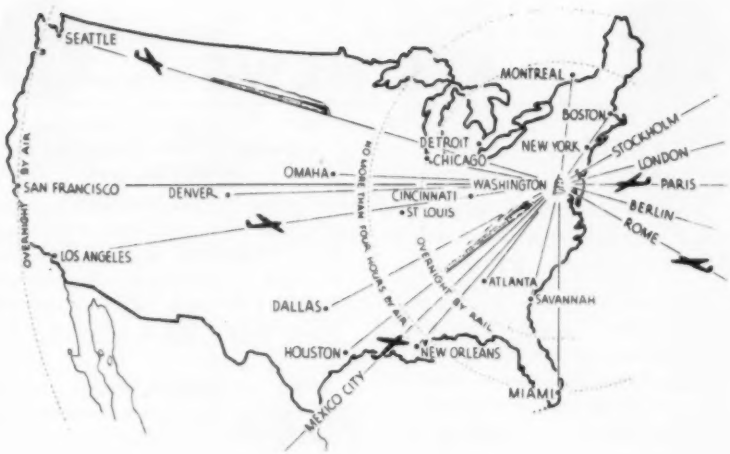
BOTANIC GARDENS—1st and Maryland Avenue, S. W. NAtional 8-3120, Extension 269. Open Sunday through Friday, 9:00 a.m. to 4:00 p.m.; Saturday, 9:00 a.m. to 12:00 noon.

FOLGER SHAKESPEARE LIBRARY—201 East Capitol Street. LIncoln 6-4800. Open Monday through Saturday, 11:00 a.m. to 4:30 p.m. (Closed on Sunday and Legal Holidays.)

LIBRARY OF CONGRESS—1st Street between East Capitol & B Street, S. E. STerling 3-0400. Exhibit Halls open Monday through Saturday 9:00 a.m. to 10:00 p.m.; Sunday 11:30 a.m. to 10:00 p.m.

NATIONAL GALLERY OF ART (MELLON GALLERY)—6th and Constitution N. W. REpublic 7-4215. Open daily 10:00 a.m. to 5:00 p.m.; Sunday 2:00 p.m. to 10:00 p.m. Concert every Sunday evening at 8:00 p.m. in East Court Garden.

NATIONAL GEOGRAPHIC SOCIETY—16th & M Streets, N. W. DIstrict 7-3330. Open 8:30 a.m. to 5:00 p.m., Monday through Friday. Closed Saturdays, Sundays and legal holidays.



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AES NEWS

AES MOTION PICTURE DIRECTORY RELEASED

A motion picture directory, the third release of the Branch Officers' Manual, was mailed to branches in January.

This directory was compiled and edited by R. L. Flint (Rochester branch), S. S. Knight (Boston branch), and I. W. Marcovitch (Philadelphia branch), under the direction of Dr. Samuel Heiman, AES First Vice-President and National Educational Chairman. Close to 150 films are listed in this BOM installment covering electroplating, metal finishing and allied technical subjects for showing at branch meetings.

A supplementary directory is scheduled to be issued every two years with new films to be announced in PLATING as they are received.

EMPIRE STATE REGIONAL APRIL 14, 1956

The date for the Second Annual Empire State Regional Meeting of the American Electroplaters' Society has been set for April 14, 1956 at the Hotel Statler, Buffalo, New York. This announcement was made by Frank W. Rudolph, chairman.

After the successful inaugural of this annual affair last year in Rochester, the Buffalo Branch is working earnestly to develop a program fully as interesting and entertaining.

There will be an educational session on a few timely subjects, a very interesting program for the ladies, and a banquet and social program in the main ballroom of the Hotel Statler in the evening.

Further details will be forthcoming in the next issue of PLATING magazine.

American Electroplaters' Society
ANNUAL TRI-STATE REGIONAL MEETING

Dayton Biltmore Hotel **Dayton, Ohio**
March 10, 1956

Educational Program—2:00 P.M.

Clyde Kelly, AES President—*Moderator*

1. "Color Anodizing," by H. Bengston, Stolle Corp., Sidney, Ohio.
2. "Plating on Unusual Metals," by Dr. Charles L. Faust, Battelle Memorial Institute, Columbus, Ohio.
3. "Plating for Out-of-Door Exposure," by C. F. Nixon, Head of Electrochemistry Department, Research Staff, G. M. C., Detroit, Michigan.

The social program will include a banquet at 6:30 P.M. followed by entertainment and dancing. Banquet tickets are available at $6.50 each. Tickets may be obtained from Jack V. Baker or Julius Teres (Dayton Branch), or from any of the Branch representatives.

Make your reservations with Mr. Baker or Mr. Teres or be sure that your Branch representative makes them for you

HAROLD W. FAINT—1895—1955

Faint

On December 22, 1955, one of the hardest working members of the American Electroplaters' Society, suffered a fatal heart attack. Harold W. Faint, son of one of the charter members of the AES, Edward Faint, attended Rutgers University. Though World War I was declared just prior to commencement, he enlisted and served as an Officer throughout the war. However, he was given leave to return and graduate with his class in June of 1917. In 1926 he married Miss Marguerite Potter, whose understanding companionship served as an inspiration in all his activities for the remainder of his life. During World War II, he again answered his country's call, serving as a Major stationed in Vienna. Just prior to his death he was retired from the US Army Reserve with the rank of Lieutenant Colonel.

Faint had a long industrial record, which included work in nonferrous metallurgy (copper and lead); organic synthesis (quantity production of saccharine); polishing, buffing and plating and the equipment involved in the metal finishing industry. As an early worker in the use of ion exchange for waste disposal, he became an authority in that important field. He had already been recognized for his knowledge of filtration. In adapting automatic equipment to production, he had few equals. In scanning the records, there are few men whose written contributions to the field of plating cover so wide a time span.

The first article appeared in May of most the and 1916, recent in June, 1954. His chapters on the subject of filtration, appearing in the "Electroplating Engineering Handbook," and the "Plater's Guidebook" are widely acknowledged. He taught the first course in chemistry offered for electroplaters.

Frederick B. Stevens, Inc., for whom he was Chicago District Manager at the time of his passing, as well as the companies with whom he was associated in the years past, praise his accomplishments.

To Marguerite Faint, his wife, and to his daughter, Jean Faint, M.D., now specializing in Ophthalmology, go our heartfelt sympathies and a reminder that the world is a better place because Harold Faint was in it.

DR. ALLAN E. CHESTER

Dr. Allan E. Chester, Vice-President of Promat Division, Poor and Company, died November 20, 1955, en route to Honolulu. He was fifty-four years old.

Dr. Chester received his Bachelor of Science degree at Kenyon College, Gambier, Ohio, and a Doctor of Science degree from California Institute of Technology, Pasadena, California.

An outstanding research chemist, Dr. Chester held many patents in the fields of electrochemistry and vitreous enameling.

Dr. Chester came to Poor and Company from Ferro Corporation in 1938, and as Research Director, formed the Promat Division of Poor and Company. He was made vice-president in 1952.

Dr. Chester was active and held offices in a number of technical societies, among them, The American Electroplaters' Society, American Society for Testing Materials, Ceramic Society, National Association of Chrome Furniture Manufacturers, The Electrochemical Society, Faraday Society, and The American Association for the Advancement of Science.

Dr. Chester is survived by his wife, Alice, Highland Park, Illinois; a daughter, Sister Vera C.S.J., Jamestown, North Dakota, and two step-sons, John H. Bins of Lake Bluff, Illinois, and Thomas W. Bins, of Lake Forest, Illinois.

AES Membership Report

ELECTIONS

Chicago: J. B. Boggs, S. D. Boggs, J. A. Bouchoux, J. F. Daley, I. Fako, W. Finn, E. Miller, S. Weincouff
Dayton: W. L. Black
Detroit: B. R. Jeremias, H. J. LeBlanc, W. G. Manko, E. J. Seyb, Jr., R. I. Thomas
Grand Rapids: J. O. Smith, C. F. Williams
Indianapolis: D. E. Chegar, T. N. Clark, Jr., R. H. Gwynn, A. M. Howard, W. V. Pitkin, W. B. Spall
Los Angeles: H. Ey, S. Martin, N. Starck
Louisville: H. D. Bowsher, R. D. Wallin, F. E. Wilcher, Jr.
Milwaukee: T. McCullough, R. Strommen, Jr.
Mississippi Valley: D. A. Lawrence
Newark: A. Cascella, H. Koretzky
New York: R. J. Keating, N. Pappas, C. J. Reilly, F. Saras
New Haven: J. Chordas, F. A. Fox, N. Ismailoff, A. C. Wellings
Philadelphia: C. E. Hyde, G. A. Kallenbach, Jr., C. Kramer, J. J. Laurilliard, R. Mazza, B. Mohr, H. C. Morris
Rockford: S. S. Dulin, L. O. Woods
St. Louis: F. A. Runzi
Saginaw Valley: W. Millman
St. Joseph Valley: J. B. Kimble
San Francisco: H. Geer, B. Harrison, J. A. Pope, D. R. Warner
Southeastern: J. E. Kinnerly, M. C. Robbins
Toronto: C. Skelding, J. Zajdowski

REINSTATEMENTS

Newark: H. Harris
Rochester: G. A. Miller

TRANSFERS

Capitol District: G. A. Miller from Rochester
Columbus: J. O. Cram to Dayton
Dayton: J. O. Cram from Columbus
Detroit: W. J. Pierce to Cleveland, D. J. Schindebette from Saginaw Valley
Grand Rapids: T. A. Downey from Newark, W. S. Springer to Cleveland
Los Angeles: J. Simon from Bridgeport
Mississippi Valley: R. B. Eyre from Chicago, L. O. Gilbert from Chicago, J. L. Stoneking from Chicago, R. L. Stoneking from Chicago, Kermit Wolff from Chicago
Newark: O. R. Jackson to Cleveland, D. Sivertsen to Indianapolis
New York: O. W. Jommersbach from Kansas City
Rochester: G. A. Miller to Capitol District
Saginaw Valley: L. E. Glynn from Detroit, D. J. Shindebette to Detroit
Toronto: J. C. Harden from Hamilton

RESIGNATIONS

Cleveland: R. W. Kress, H. E. Wolf
Indianapolis: L. L. Deer, R. B. Ellsworth, J. M. Eltzroth, L. Knight, O. H. Kernodle, E. H. Messmore, C. A. Minor, R. W. Oyler
New York: S. Maynard, W. Vella
Saginaw Valley: J. Davis
San Antonio: P. A. Lorentz
Toronto: Chih-Yeu-Lu

SUSPENSIONS

Detroit: R. P. Basco, B. N. Baur, V. P. Bayley, C. A. Biglow, H. H. Blizzard, H. C. Bornand, H. Bradley, C. E. Campbell, J. T. Collier, B. B. Davis, B. E. Drury, Jr., H. W. Felsner, R. D. Gair, N. Godo, N. Goertz, J. A. Gordon, D. A. Goss, P. Hoeffel, A. Hunter, C. E. Hutchinson, G. M. Kerr, W. B. Knight, Jr., T. E. Kruger, F. S. LeTarte, J. J. Malone, L. T. Matniak, R. McManus, G. Moakes, M. A. Parker, J. Picarski, F. M. Proctor, E. J. Prozaki, W. D. Putman, A. Robinson, B. Rogers, N. R. Schmidt, S. A. Sedore, J. H. Toner, M. Wallace, J. E. Warren
Indianapolis: W. Cunnington, B. F. Leckron, M. G. Osman
Lancaster: J. H. Fry
Newark: A. Avilla, H. Brown, H. D. Bruyn, A. Cafaro, D. Carle, J. Efinger, V. Frey, C. Gerber, H. Hackenberg, S. Harris, R. Homa, R. Homestead, J. Kane, W. Kolowitz, S. Macy, C. Meffley, H. J. Mueller, M. Parisi, J. Schmerin, F. Somolo, A. Tannenbaum, A. F. VonHirsch, M. Zack, S. Yacus
New York: A. M. McKay, M. Stangl
Providence-Attleboro: T. Tanury
San Francisco: A. Depalma, T. T. Johnson, Jr., C. R. MacDonald, J. M. Saunders, J. C. Standley, E. F. Wall, R. D. Walton, R. V. Zimmerman
Sydney: B. Allpress, A. J. Anderson, F. Bellenger, J. Buckley, S. A. Goubareff, T. Hampson, H. Noel, A. Parish, H. Roberts, F. J. Strong

DEATHS

Chicago: W. Varnish
Grand Rapids: R. N. Brach
Los Angeles: J. Murrieta
Rochester: J. G. Hall
Toronto: A. Spicer

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Effect of Basis Metal Condition on Plating

I. Taper Sectioning of Basis Metal Surfaces and Electrodeposits
II. The Influence of the Physical Metallurgy and Mechanical Processing of the Basis Metal on Electroplating

By
A. E. R. Westman and F. A. Mohrnheim

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RESEARCH REPORT—SERIAL No. 31—PROJECT No. 4

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By
G. J. Kahan, W. W. Macchia, J. M. Fairbank

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Porosity of Electrodeposited Metals

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N. Thon, D. G. Keleman, Ling Yang, Stella Yang, Douglas Dean

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Meet Mr. President

Narcus
Boston Branch

Harold Narcus was born September 20, 1912 in Worcester, Massachusetts. He is married and has three children. He was graduated from Worcester Polytechnic Institute with a BS degree in Chemistry in 1934 and returned to Worcester Tech for his Masters degree in chemistry (1947–1949). He then attended Clark University, Worcester, Mass. from 1949–1951 for Graduate Work leading to a PhD degree in chemistry.

Narcus is President & Technical Director of Electrochemical Industries, Inc., Worcester, Mass. a company specializing in metallizing nonconductors. He holds numerous patents in this field and has presented many technical articles before the AES and other societies on this subject.

Harold is a member of the Boston Branch, American Electroplaters' Society; American Chemical Society; Sigma Xi; Society for the Advancement of Science; and the Electrochemical Society.

Stovall
Southeastern Branch

The Southeastern Branch introduces Clyde Stovall, the plating superintendent of Scripto, Inc., Atlanta, Georgia. Mr. Stovall was born and raised in Atlanta, Georgia, and attended public schools and night schools there. He is a skilled and experienced plating authority who has been with Scripto 21 years. Scripto's plating department is one of the most varied in the Southeast, doing copper, nickel, chromium, cadmium, gold plating, and aluminiting.

Clyde is one of the 12 original charter members of the Southeastern Branch which covers most of the southeastern states. This branch was organized in Atlanta in 1946. During the 10 years that the Southeastern Branch has existed, he has served earnestly and efficiently as Librarian, 1st and 2nd Vice President, and on various important committees, and this year as President. He has the special honor of being the first President to stage the Southeastern Branch's First Annual Technical Educational Session, which is scheduled for February 10 & 11, 1956, at the Biltmore Hotel in Atlanta, Georgia.

Mr. Stovall is married and has two children—Lamar, 17; and Rilla, 12. His favorite pastime is target-shooting and hunting.

Current News
FINAL EDITION
H-VW-M REDUCES PRICES* UP TO 25% ON GERMANIUM RECTIFIERS!
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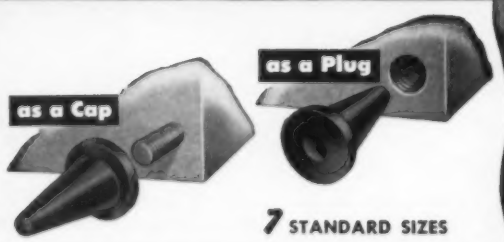

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BRANCH NEWS

BALTIMORE—WASHINGTON

Gardner on Plastic Tanks

The December 13, 1955 meeting of the Baltimore-Washington branch was held in the Chemistry Lecture Room in the Chemistry Building at the National Bureau of Standards, Washington, D. C., president **William Metzger** presiding.

After a brief order of business, librarian **Edward Bertucio** introduced the speaker, **Bryant H. Gardner,** of Pla-Tank Inc., who spoke on "Applications for Polyesters in the Metal Finishing Industry."

Gardner began his talk by drawing on the blackboard a diagram which he used to illustrate the particular types and their properties of those plastics used by Pla-Tank Inc. in the fabrication of their products.

This introduction was followed by an excellent color and sound movie to show to us the fabrication methods used in the construction of the various tanks, fume hoods, duct work and boats made by this company. This movie also portrayed numerous installations of this unique equipment together with shots showing the ease of handling and transporting articles made of this durable, strong and lightweight material.

That considerable interest was aroused was evident by the length of the question and answer period which followed.

BRIDGEPORT

And a Swell Time Was Had

The Bridgeport branch AES held its annual Christmas Dinner Dance in the Hotel Barnum, Bridgeport, Conn. on Saturday, December 10, 1955.

More than 160 members and guests attended this annual festivity at which much of the traditional holiday spirit of "peace on earth to men of good will" prevailed.

After dinner was served, the fun started with an excellent floor show imported directly from N.Y.C. It was in very good taste and received many curtain calls. A substantial part of the expense involved was absorbed by Messrs **Richard, Ferguson** and **McNeill.**

The raffling of turkeys (over 20 lbs each) provided no small measure of entertainment. Another feature was the distribution of door prizes; this is that part of the evening to which the fair sex looks forward with great anticipation. Santa Claus (**Frank Maday** of Casco Products) saw to it that all the good little boys and girls did not receive "nuttin fo Chrismass." The "cup that cheers" was most prominent as the evening wore on. Dancing to the tuneful melodies of Bob Weller's orchestra provided the "itchy feet" ones a chance to exhibit their talents.

The Bridgeport branch is grateful to **Bob Creamer** of HVWM for the beautiful favors he provided. Also to the following for their excellent door prizes, **Ray Goral,** Enthone; **Geo. Haas,** Wyandotte; **Mike Tamas,** Roberts Rouge; **Walt Lynch,** Stevens; **Bob Parker,** R. O. Hull; **Bill Ehrencrona,** Casco; **Al Ferguson,** MacDermid; **Steve Imrischak,** Precision Tumbling; **Bill Lindsay,** Chemical Corp.; **Floyd Tatum,** Oakite.

BOB PARKER
Secretary-Treasurer

CHICAGO

Three Great Meetings; A Giant's Passing; Editorial Board Members are Guests

A pre-Christmas spirit pervaded the Chicago branch on December 9, 1955, when the members met for their usual monthly meeting in the clubrooms of the Western Society of Engineers. A solemn beginning at the business meeting was followed by a

cocktail hour during which the spirit moved many to wisecracks and all to general camaraderie giving the occasion a truly holiday touch. To round off the evening, the Educational Meeting, which was conducted as a symposium, covering the subject of "Lining Materials for Use With Corrosive Fluids," was very capably handled by the following panel: **Charles H. Angell,** president, Corite Products, Inc; **Charles Kramer,** assistant sales manager, Carpart Corporation; **Mike Nakashima,** process engineer, Belke Manufacturing Company.

All of the speakers have excellent academic backgrounds and sufficient years of experience in the field so that they spoke in practical terms and to the point. As a result most of the audience had a better understanding of the lining materials best suited to their own conditions and to the particular processes they are operating.

Among the questions answered by the December panel of experts, **Charles Grenko** of Western Electric Company on "Organic Finishes," **John Cuttone** of Motorola, Inc. on "Plating on Aluminum" and **S. P. Gary, Jr.** of Grunwald Hard Chrome Division on "Plating on Non-Metallics," were the following:

Q. What organic coating is best for adhesion to Chromium?
A. An epoxy or alkyd melamine resin. Suggested for all but zinc base materials because of temperature of curing.

Q. What is the best method to get black to stick on brass?
A. A nitric acid, or a nitric acid and phosphoric acid etch. Do not bake or use a synthetic.

Q. Zincate coatings vs adhesion (concentration of the Zincate as a function of adhesion in plating on Aluminum).
A. If too fast it results in a spongy deposit. If too slow you get a spotty deposit.

Members were again reminded of the Annual Educational Session and Banquet to be held at the Grand Ball Room of the Conrad Hilton Hotel in Chicago on January 28, 1956. An excellent choice of speakers on timely subjects, plus a well planned dinner dance and top-flight floor show promises those in attendance that their time and their money will be well spent.

FRIDAY the 13th!! Holy Black Cats!! still, the members of Chicago branch, undaunted by traditional superstition, met in full force for their usual monthly get-to-gether at the Western Society of Engineers on January 13, furnishing further evidence of the progressive spirit which pervades this branch. Undoubtedly, the fine list of technical speakers provided by the librarian **Russ Harr** contributes to the good attendance record. However, the casual, comfortable bar and lounge where the boys swap stories during the cocktail hour plus the fact that Chicago is lucky in having a lively "bunch of good Joes" adds much to both the spirit and to the attendance of the branch. Visiting members of the Society will always find a warm welcome when they attend meetings at Chicago branch, and are encouraged to drop in.

Harr

Walter F. Dusseault, product engineer with Divine Brothers Company was the speaker of this meeting. In his handling of the subject "Should we Purchase an Automatic Buffing (or Polishing Machine)," he reflected his broad and varied background as well as his practical understanding of the field. Since his practical experience has included machine shop and maintenance work as well as years in design work, engineering sales and the installation of finishing machinery, his presentation conveyed information of immediate usefulness to many and was of considerable help to others in their future planning. His discussion pointed out that high labor costs and the increased stress on "eye appeal" demand that far greater consideration be given to the purchase of this type of equipment.

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ASI-600	600 gal/hr	2'x2'x2'	150 lbs.
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BRANCH NEWS

The one very dark moment to mar an otherwise bright occasion was the sadness of all upon the announcement of the passing of one of the most active members of Chicago branch, **Harold W. Faint.** The Colonel has so often been "kidded," used and abused, and made the work-horse of the branch that they will look hard and long to find a "show-filler." His sudden passing on December 21, leaves only his daughter, Dr. Jean, to carry on the Faint scientific tradition. To Mrs. Faint goes the sympathy of all of the members of the AES throughout the country. All who knew and respected the Colonel will miss him in the days ahead.

Faint

The branch's Annual Educational Session and Dinner Dance was held at the Conrad Hilton Hotel, Saturday, January 28, 1956. The usually good technical program planned by librarian Russell E. Harr and his committee together with the outstanding dinner dance and top-flight star entertainment under the direction of banquet chairman, **R. Scott Modjeska,** attracted a great number of out-of-town visitors among whom were AES Executive-Secretary **P. Kovatis** and **A. Doria,** Editor, PLATING. The speakers for this meeting were all nationally known and respected. Headed by **R. S. Wysong** of Studebaker-Packard Corporation, acting as moderator; **Phil J. Ritzenthaler,** president of Plating Engineering Company spoke on "Engineering Uses of Plated Coatings." **Joseph M. Andrus,** chief chemist of Croname, Inc., discussed "Decorative Anodizing," and **Walter Pinner,** executive staff engineer of Houdaille Industries, Inc., brought the record up to date with "A Progress Report on Accelerated Corrosion Tests for the Performance of Plated Coatings." During the evening, following a sumptuous feast, members were entertained by a number of outstanding star acts topped by **Lou Breeze** as Master of Ceremonies, with his orchestra acting as accompaniment for the show and furnishing music for dancing during the remainder of a very gala evening. Members of PLATING magazine's Editorial Board who met on Friday were special guests of the Chicago branch.

Pinner

JEROME KUDERNA
Publicity Chairman

CENTRAL MICHIGAN

Herberth Head gets Around

Head

The Central Michigan branch met at the Hotel Hayes, Jackson, on December 13, 1955. We were honored by a visit from the 3rd vice-president of the Society, **Herberth Head,** who gave us a brief talk on promoting added attendance at meetings. The principal speaker of the evening was **R. M. Krause** of F. J. Stokes Machine Co. who gave us an excellent illustrated talk on vacuum metallizing. After the talk Krause showed samples of metallized work and conducted a question and answer period.

G. S. WOODRUFF
Publicity

COLUMBUS

A New Librarian; Coffee and Donuts by Don Swickard?

The regular monthly meeting of the Columbus branch, AES was held at Battelle Memorial Institute on Friday, December 2, 1955 at 8:00 p.m.

Following a film on die casting entitled "How Else Would You Do It?" the business meeting was called to order by president **Nathan Koslin.**

The minutes of the November meeting were read and approved.

The Columbus branch representative to the permanent Tri-State Committee, **Walter Denny,** read amendments to the proposed Tri-State by-laws and advised that the amended by-laws have been approved by Dayton, Indianapolis and Louisville branches. A motion was made by Walter Denny that the Columbus branch approve the Tri-State by-laws as amended. This motion was seconded and carried.

President Koslin announced that librarian **Harry Moore** will leave Columbus to accept a new position and therefore would no longer be able to function as librarian. Nominations were therefore in order for the office of librarian. **George Skelly** was unanimously elected librarian.

Treasurer **Wilbur Hespenheide** announced that membership cards were available and that outstanding dues would be accepted.

Harry Moore reported that payment would be required for the use of the projectors. He then introduced the speaker of the evening, **Ralph Pettit,** of the Diversey Corporation, and formerly with the Chicago Thrift Etching Corporation, whose subject was "Metal Finishing in the Nameplate Industry."

After an interesting talk a round of applause was accorded the speaker.

The meeting was then adjourned in favor of coffee and donuts by **Don Swickard.**

MICHAEL FARR, JR.
Secretary

DALLAS-FT. WORTH

Two Meetings; Two Considerations of Plating Room Wastes

The November meeting of the Dallas-Ft. Worth branch was well attended with 31 present including 8 visitors. One new member was elected to membership; **L. V. Thornton** of Waco, Texas.

Our speaker was **Dr. C. F. Garland,** manager of Industrial Waste Sales for Infilco, Inc. The introduction was handled by **Dr. Halff,** a long time friend of the speaker. A lively session followed the presentation of "Treatment of Plating Room Waste."

Refreshments were furnished by Van Waters & Rogers Inc.

The regular dinner meeting of our branch was held at the Lennox Hotel, Grand Prairie, Texas. With Christmas at hand, we were delighted that 17 persons could attend the meeting.

All were well rewarded with the talk and demonstration given by our speaker, **W. S. Hosford,** of Houston, Texas. Hosford is the general manager of the Houston factory of G. A. Mosites Co., Ft. Worth, Texas. His talk and demonstration was centered around rigid plasticol and its many applications in the plater's plant. Keen interest was in evidence when we were shown samples of the new tank lining material which is an unplasticized material on one side and plasticized on the other. The ease of handling and welding of the rigid PVC was a surprise to most listeners.

A committee was formed to handle the educational problems connected with the enforcement of the City of Dallas limits of plating room waste. We feel the committee can be very helpful to all concerned. Those appointed were **A. Larson, W. Trembly, G. Monroe,** and **K. W. Porter.**

Refreshments were furnished by the LaSalco Company.

R. H. HEPPEL

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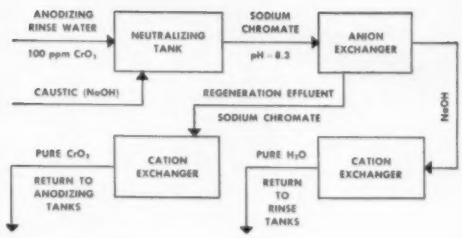

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BRANCH NEWS

DETROIT

The Nickel Story* and the Annual Christmas Party

The evening session began promptly at 8 P.M. December 2, 1955, in the Wayne Room of the Statler Hotel.

An interesting feature of the meeting was a film showing the various methods of mining nickel. One method not shown was getting more anodes into the nickel tanks.

Lee Morse introduced many of the past presidents from both the National Society and the Detroit branch and AES Executive

Part of the 1,800 who attended Detroit Annual Christmas Party at Detroit Statler on December 3

Secretary **P. Kovatis. Bob Racine** announced the names of the two new sustainirg members, Metal Plating Inc. and Advanced Plating. Welcome to the fold, Gentlemen! ! !

Ed Kubis introduced five new applicants and these gentlemen were promptly voted into the membership.

Kelly

Doug Thomas, as moderator for the branch, introduced **Clyde Kelly,** President of the National Society. As Technical chairman, Kelly gave a short talk on the theme of the program—"The Metal Story." He then introduced the featured speakers of the evening, **H. B. Director, John Palik** and **Dr. A. Kenneth Graham.**

Director, from the United States Department of Commerce, gave a short talk on the nickel situation from the Government standpoint.

Palik, National President of the NAMF, pointed to the plight of the job shop platers since the inception of the Korean War.

Dr. Graham spoke on substitute finishes, none of which can compare to or take the place of, nickel or chrome.

The meeting adjourned for refreshments at 10:20 P.M.

PAT DRISCOLL

[* For full report of The Nickel Story see Jan. issue, **Plating,** pp 91-106; p. 50. Also Feb. issue, **Plating,** p. 250 ff. . . . Ed.]

INDIANAPOLIS

Duke Wysong May Run Again

The December 7, 1955 meeting was attended by 32 members and guests. Delicious steaks were enjoyed by all at the Fox Steak House. Guests included **H. Voldner,** RCA Victor Ltd., of Smith Falls, Ontario, Canada. Our first vice president, **Bert Hawhee,** presided. After the usual opening procedure and reports by the secretary and treasurer, one new member was

voted into the Society. He was **Addison M. Howard** of Mooresville, Ind. This motion was made by **Les Reynolds,** seconded by **Abraham Max** and carried. One transfer was announced for **Richard W. Priddis** from the Philadelphia branch who is employed by Snap-On Tools Corp. of Mt. Carmel, Ill.

New business included the following: Announcements of the Chicago annual meeting on Jan. 28, 1956; of **Duke Wysong's** candidacy for 3rd vice-president; report of delegates to last summer's convention; (This last was given by Reynolds and Max). A report was also given by **Frederick Anderson** on the Tri-State business and plans.

Since our president was absent, some business was left until the January 1956 meeting. This included the election of delegates for the year 1956.

The program was given by **Clayton Marks** of Clayton Marks, Inc. of Chicago, Ill. His topic was "Acid Zinc." With seventeen years' experience in operating this type plating, Marks was well versed on this topic. He told of every phase of operation, how the solution was controlled, the kind of materials plated, the brightness or dullness of the plate and compared it with cyanide zinc. The group had many questions to ask about this type solution.

After refreshments the meeting adjourned at 9:30 P.M.

EDNA ROHRABAUGH
Secretary

LOS ANGELES

Nickel Robberies

The November meeting of the Los Angeles branch was held on Wednesday, November 9 at the Rodger Young Auditorium with 107 members and guests present. President **Arnold** called the meeting to order at 8:00 P.M. Sergeant-at-arms **Pete Esten** introduced the visitors, and the reports of the secretary and treasurer were read and approved. Vice-president **Stoner** then introduced three new candidates for membership and three new members were elected.

Under the heading of new business there was a discussion on the series of robberies that have been occurring the past few months to the plating job shops. It was pointed out by president Arnold that the suppliers have no way of getting additional nickel for those unfortunate enough to have their shop robbed but that the shop owners take extra precaution to maintain what they have by devising locks for the anode bar.

The meeting was then turned over to **Norman McEwan** who introduced the speaker for the evening, **James Carland** of the Chandeysson Electric Co. who presented a movie and talk on the new Chevrolet Plant at Lavonia, Mich. After a discussion period meeting adjourned at 10:00 P.M.

GEORGE J. HETZ,
Secretary

MELBOURNE

Leslie on Heavy Deposits; Lucky Aussies Have Nickel!

Tikotin took the Chair before 55 members and friends and then **J. Dale** moved that in view of the nature of the lecture about to be presented that the reading of the minutes of the previous meeting be postponed until the next general meeting.

J. Parker introduced the speaker for the evening—**B. A. Leslie,** B.Met.E., managing director of Aviation Electroplating Industries, who then spoke on "Heavy Deposits for Engineering Purposes." In view of the very special supply in Australia, the aspect of salvage of worn or damaged equipment is perhaps of greater importance than in some other countries. However, the amount of treatment of new work and of electroformed work performed here is also considerable. The main deposits for all this work are heavy deposits of copper, hard nickel and hard chromium. Leslie compared the techniques and requirements of these heavy electrodeposits with those for purely decorative and/or protective coatings normally encountered in jobbing shops. The factors determining selection of material for particular treatments were outlined and aspects of handling of special shapes and sizes were well illustrated by picture slides.

Cox of Perth proposed a vote of thanks to the speaker.

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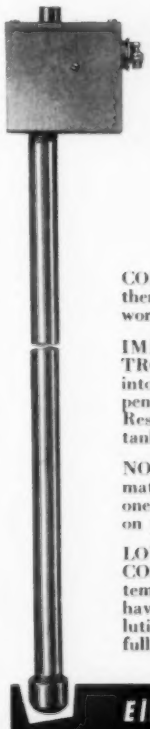

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BRANCH NEWS

MISSISSIPPI VALLEY

President Gilbert on Hard Chromium Plating

The Mississippi Valley branch of the AES held their December 21 meeting at the Saddle Club Barn. It was preceded by a dinner in the dining hall.

The meeting was called to order by **Joe McConaughey,** who first asked each person present to stand and introduce himself. Joe then introduced the speaker, our president, **Lloyd O. Gilbert,** whose subject was "Hard Chromium Plating."

Gilbert

Gilbert started his talk by giving a history of chromium plating. He related how the discovery of the use of sulfate as a catalyst was an accident, when Bunson accidentally used impure chromic acid in making up his bath and how Buff was unable to duplicate his work using pure chromic acid. He cited the Fink patent to United Chromium Co., which called for 250 g/l of chromic and 3 g/l of sulfuric acid.

Gilbert projected a number of slides showing effects of temperature and current density on bright range, efficiency, rate of plating and hardness. He pointed out the advantages of using higher current densities and temperatures. He also showed a slide showing the conductivity vs bath concentrations and pointed out the advantage of the 33 oz/gal bath in this respect.

Gilbert pointed out that the greater the current density, the greater the hardness; that certain ions in the bath increase hardness but are deleterious to adhesion; that trivalent chromium has little effect on hardness. A slide was shown of a plated item which had a random scattering of half-moons which was attributed to low bath catalyst content.

Joe McConaughey thanked the speaker and asked for the minutes of the November meeting. These were read by the secretary. Joe McConaughey extended the branch's welcome to our visitors and asked them to come again. Visitors were: **A. H. Rauch, Bernard Kilberg** and **C. W. Ray** of Deere and Co.; **C. A. Pickering** of Hanson-Van Winkle-Munning Co.; and **E. A. Logan** of Electro Coatings.

John Hartman announced that our next meeting will be held at the Tower Restaurant in Moline on the 18th of January.

Meeting adjourned at 10:35 P.M.

A brief executive meeting was held after the regular meeting at which time it was unanimously agreed to set the dues at $10.00 for the coming year.

PAUL G. CHAMBERLAIN
Secretary-Treasurer

NEWARK

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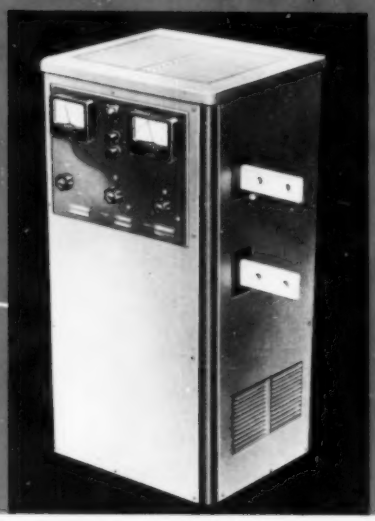

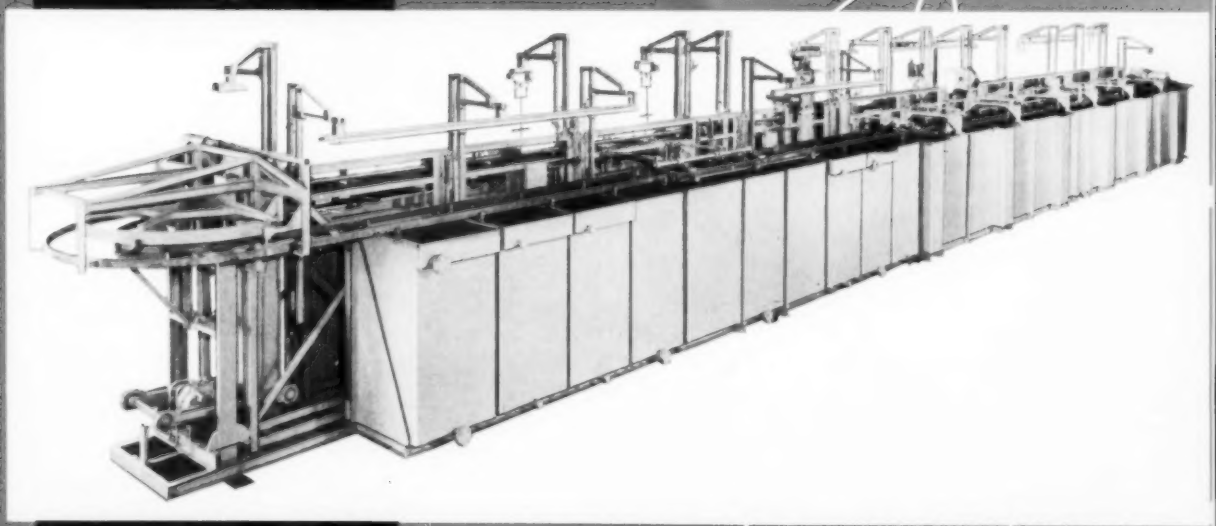

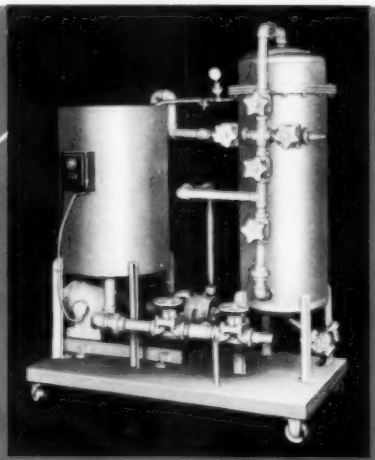

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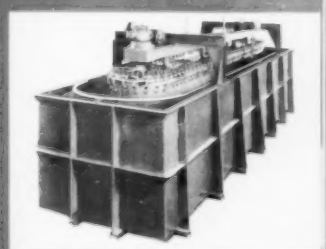

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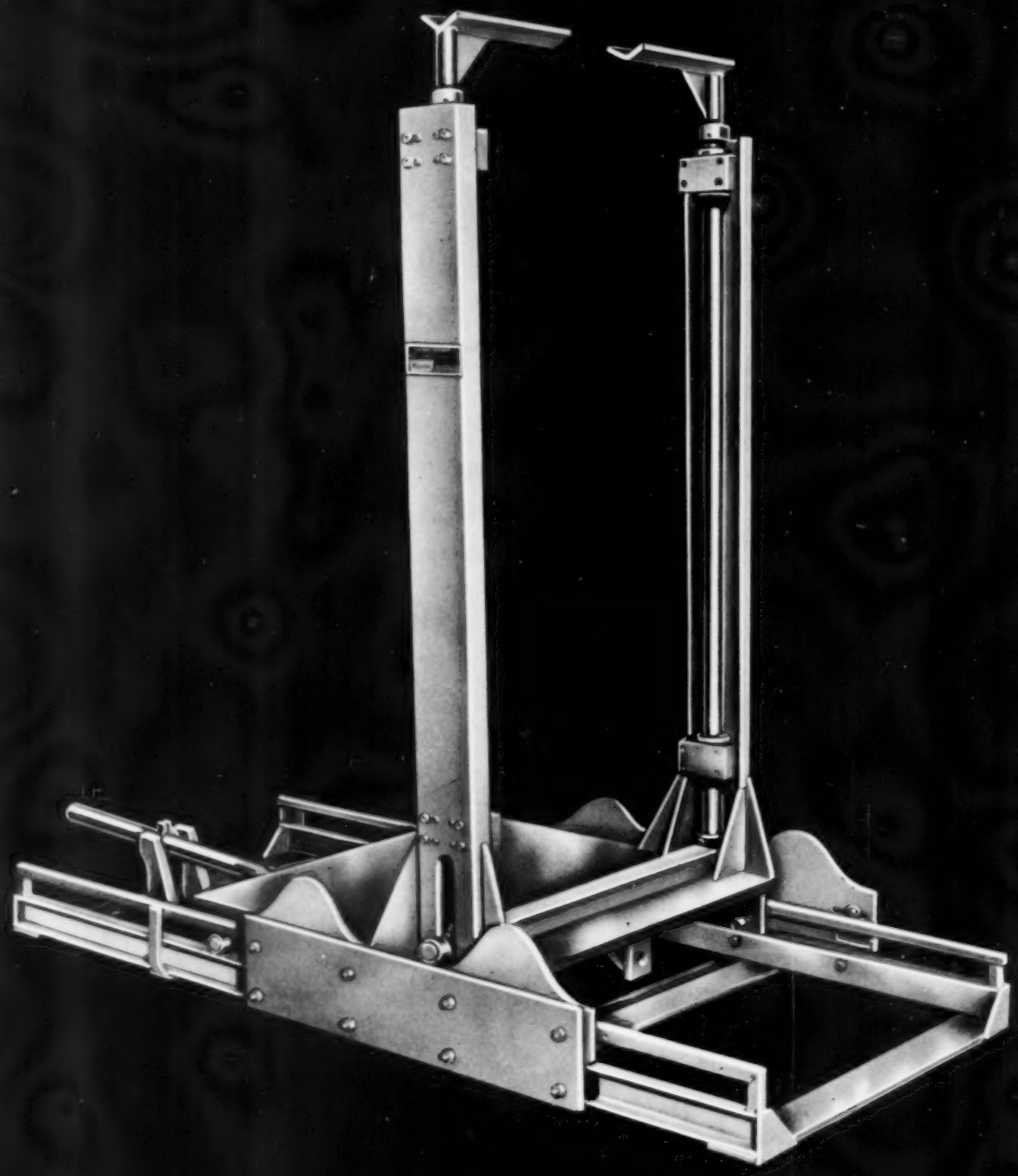

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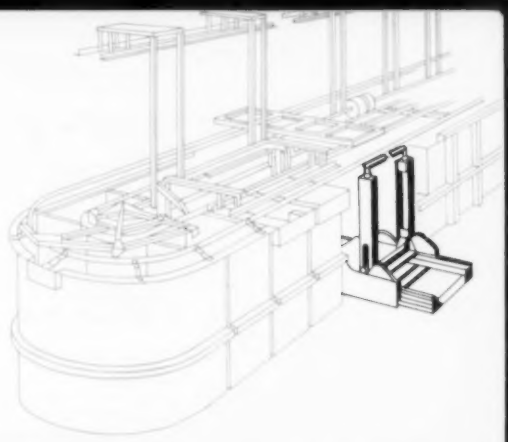

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It makes no difference what make or type of automatic processing equipment you now have; the Auto-Loader is *easily adapted to any automatic using an intermittent motion,* double or single lane. If desired, Wagner Brothers will engineer it into your present system at a nominal service charge.

Unlike some automatic loaders, the Auto-Loader will accommodate a monorail conveyor operating on different planes—you needn't rebuild your conveyor.

Its rugged construction, absolutely simple design virtually eliminate maintenance headaches, even under continuous heavy service.

All transfer mechanism is mounted on a reciprocating platform, moving on rollers in a channel track. Cam followers attached to the lifting arms duplicate the eccentric contour of the side plates to raise and lower the lifting arms into the loading and unloading positions. The cycle of the Auto-Loader is controlled by the limit switches of the automatic, actuated by a hydraulic cylinder (or an electric drive) to move in perfectly-timed unison with the transfer cycle of the automatic.

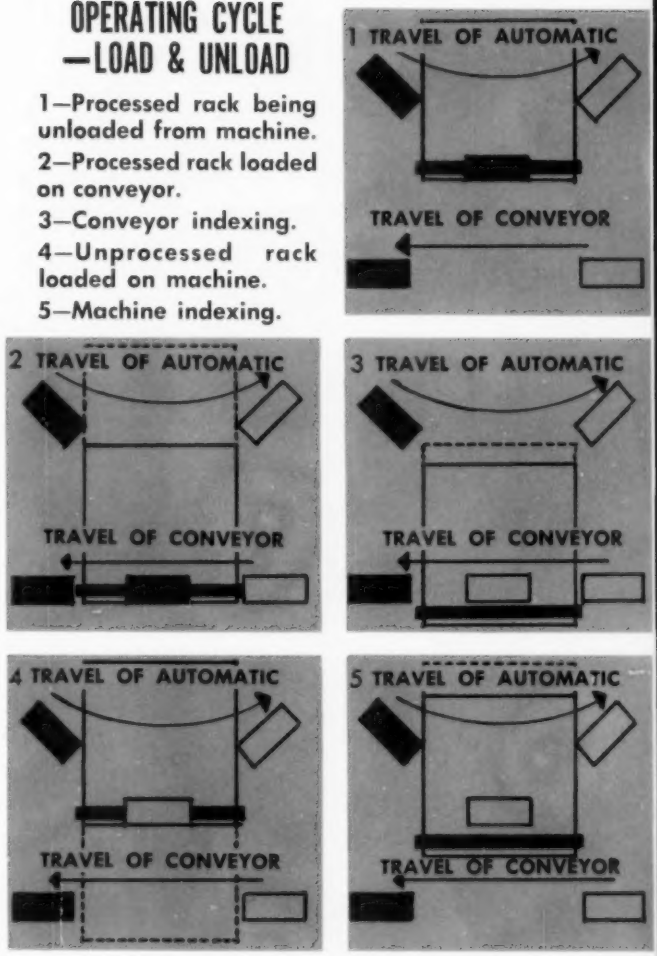
**Patents Pending*

The Auto-Loader can be used for any automatic parts processing operation such as electroplating, anodizing, phosphate coating, etching, electropolishing, oxide coating, painting, cleaning, etc.

WRITE NOW FOR PRODUCT INFORMATION AND QUOTATION

OPERATING CYCLE —LOAD & UNLOAD

1—Processed rack being unloaded from machine.
2—Processed rack loaded on conveyor.
3—Conveyor indexing.
4—Unprocessed rack loaded on machine.
5—Machine indexing.

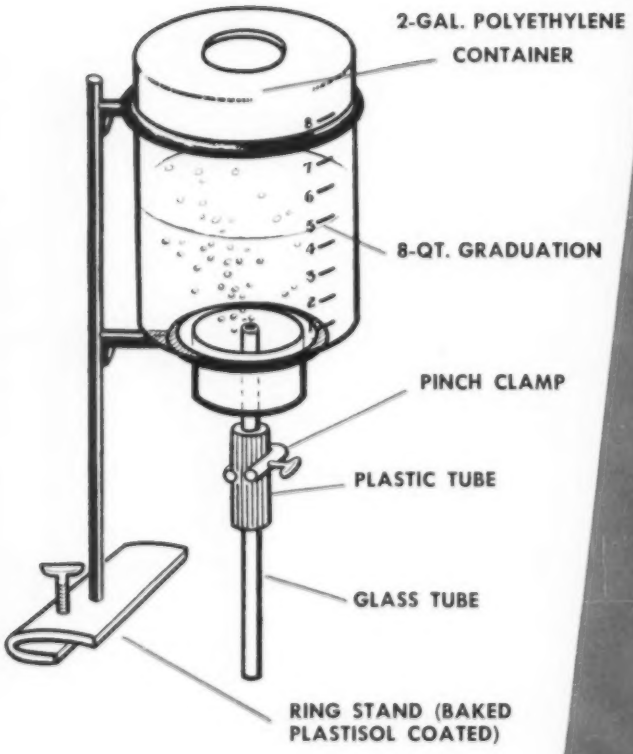


PROCESSED RACK UNPROCESSED RACK

WAGNER
BROTHERS, INC.
400 MIDLAND • DETROIT 3, MICH.

a sure and easy way

to dispense with chromic acid mist



KROME-ON DISPENSER

You can now control chromic acid misting more accurately, easier than ever before by using Krome-On* mist-inhibiting additive in this new dispenser. A graduated scale on the 2-gal. polyethylene container indicates the quantity to add; you make additions effortlessly by opening a pinch clamp, letting the solution flow into the tank.

Many chrome platers have already discovered the remarkable mist-inhibiting qualities of Krome-On addition agent. You, too, will find that Krome-On costs you nothing to use; it pays for itself in decreased chromic acid spray, drag-out and flue losses. It simplifies waste disposal, assures a safe, clean atmosphere at reduced ventilating cost.

And Krome-On also gives you, at no extra cost, advantages no other mist inhibitor can offer. Krome-On actually improves the efficiency of your chrome plating operation since you can get the same amount of throw at reduced amperage. You plate at lower current densities, thereby reduce "burning" and subsequent color buffing costs.

Since Krome-On is soluble, it will not cake-up your tanks. It does not alter the sulfate radical of the chrome bath, thus will not change the chosen ratio.

Let our service representative demonstrate the obvious advantages of Krome-On in the new dispenser. *Call or write now!*

*Patents Pending

WAGNER BROTHERS, INC.

400 MIDLAND AVE. • DETROIT 3, MICH.

PHONE TULSA 3-0100

☐ Please forward additional information on Krome-On and Dispenser.

☐ Have representative call.

NAME _____ TITLE _____

COMPANY _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

NEW HAVEN

A Ladies Christmas Party in The Three Cups

The Annual Ladies' Christmas Party was held on December 3, 1955, in the "The Three Cups," Meriden, Conn.

A gathering of about 50 couples enjoyed a good dinner and the usual conviviality associated with the season.

The ladies were well pleased with the gift they received from the branch.

BERNARD GAFFNEY
Secretary

NEW YORK

Perez Talks on Rack Coatings

On January 13, M. Perez, of the Coatings Department of United Chromium Div. addressed the Branch on "Rack Coatings and Stop-Offs." First, Perez discussed some of the chemical and electrical resistant properties which rack coatings must possess to be of practical interest. He then briefly discussed the various types of coatings, namely: tapes or rubbers, waxes and other hot dips, stop-off lacquers, and plastisols. Methods of application and removal of temporary coatings such as waxes and other hot dips and stop-off lacquers were first discussed. The main part of the talk dealt with the use of plastisol coatings. The main ingredient of these materials is a plasticizer which must be resistant to oxidation to such materials as chromic acid and to hydrolysis by acids and alkalis. A properly formulated plastisol will not oxidize until heated. On heating, the resin dissolves to form a gel, in other words, the two-phase system is converted to a one-phase system. This occurs around 350–360° F. On cooling, the gel solidifies to give a firm rack coating. The hot dip method is commonly used to apply the rack coating. In this method, the rack (*not* the plastisol) is pre-heated. On dipping, a gel up to ¼ inch thick forms on the rack and the excess drains off. Dipping is followed by baking. For maximum adhesion to metal, a primer must first be applied.

The talk was well received by the 55 members present and a lively question period ensued. At the close of the meeting, Art Pierdon of the Baltimore-Washington branch discussed briefly the forthcoming Convention. Ralph Schaefer, past-president of the AES was introduced to the members.

EDWARD B. SAUBESTRE, Librarian

PHILADELPHIA

Dr. Heiman's Class, Sustaining Members, and Metal Coloring

The regular meeting was held on December 5 and was preceded by dinner attended by 24. President **Trusdell** called the meeting to order with 44 attending plus **Dr. Heiman's** electroplating class. Guests were introduced, the minutes of the previous two meetings approved as read and seven new members were admitted. As a result of a motion, a committee was appointed, with **James E. Cogan,** chairman, to investigate change of date of annual banquet from week before Thanksgiving Day to another time.

Dr. Heiman

The secretary brought up the question of long-time members who are suspended for nonpayment of dues where there may be extenuating circumstances. He felt something should be done to maintain their status as members. The president referred this to the board of managers for possible action.

Dr. Heiman spoke a few words about the plating class present. He gave the names of the firms who were represented in the class. He asked for the aid of the branch in maintaining adequate laboratory equipment.

At the request of **Wm. Moyer,** the secretary read the names of sustaining members currently sending in checks.

The speaker was Philadelphia branch member **Eugene Zurbach, Jr.,** who spoke on the coloring of metals. Giving illustra-

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BRANCH NEWS

tions of some typical examples and formulas of this gradually extinguishing art, he discussed the many ramifications involved in attempting to produce chemical colors on metals. Because of the time-consuming efforts required, colored lacquers have made such inroads into this field as to make obsolete many once-popular finishes.

I. Wm. Marcovitch
Secretary

PITTSBURGH

Ken Huston on "Surface Finishes for Stainless Steel"

The December meeting of the Pittsburgh branch was held in the Avalon room of the Sheraton Hotel. Neither recipient of the two free meals were present at the dinner so they lost their Christmas bonus.

At a short business meeting we were pleased to receive three new applications for membership from **John Meehtly, Robert Hartung** and **Edwin Sokalski.** Also the budget was reviewed, the bid to print the new By-Laws booklet was accepted and it was decided to transfer some of the branch's funds to a savings account.

Second vice-president **Fred Dixon** introduced our speaker for the evening, **Kenneth M. Huston,** Armco Steel Corp., who talked on "Surface Finishes for Stainless Steel." Ken gave his usual fine talk about his favorite subject.

After the short pause for refreshments, Ken drew **Rex Goldbach's** name for the door prize, a beautiful Kodak Duoflex Camera with flash gun and accessories presented by **Bill** "Daddy" (a boy) **Pizoli** of Oakite Products.

Herb Schram
Secretary

ST. JOSEPH VALLEY

A Lesson in Leveling

The December meeting of this branch was held on November 30 because of prior reservations for the meeting place.

Fifty members and guests attended the dinner and technical session. An introduction of members and guests revealed a large delegation was present from Niles, Mich.

During the regular question and answer period the problem of heavy chromium plating on a high nickel alloy was discussed. A reverse sulfuric acid etch was suggested to obtain maximum adhesion.

The minutes of the November 2 meeting were read and approved. **Eugene Roth** gave a short talk on the need for increasing our membership to one hundred members.

Elmer Brady, Proctor Moore and **Art Wiegand** (chairman) were appointed as a committee to plan for Ladies Nite.

John Kimble was elected to membership in the branch.

Ray Dearth then presented **Fred Nobel** of Lea-Ronal Inc. who discussed "Leveling in Cyanide and Acid Copper Plating." Leveling is achieved in plating by building up metal in minute recesses of surface faster than the peaks. RMS was defined as average height of surface imperfections.

Methods of measuring surface finish: 1. Brush Co. Surface Analyzer; 2. Interference Microscope; 3. Plating on fine needle-like object on a V-cut to determine amount of rounding of peaks or filling of recess; 4. Surface truth—the ability of a surface to reflect a true image. A flashlight with cross section paper across it is shown on surface and moved away until no image of cross section is visible. Surface leveling may or may not be associated with brightness of the deposit. A slide was shown to depict various types of surface finish.

From cyanide copper, it is not possible to attain leveling unless RMS of initial surface is RMS/O or below. Die castings which are buffed have better than 10 RMS. Leveling may be achieved by a reduction in frequency:

Bath containing 8 oz/gal CuCN
2 oz/gal NaOH was made up and the effects of several variables checked.

EFFECT OF FREE CYANIDE: Best leveling as noted from

USE READER SERVICE CARD; INDICATE A 268.

reduction of frequency was obtained at 1.25 oz/gal free CN.

AGITATION: Is definitely beneficial to leveling.

EFFECT OF TARTRATES: Rochelle salts was slightly harmful to leveling. Supertartrate (4% by vol) was beneficial.

CARBONATES: Improve leveling slightly. DuPont High Speed Copper and Lea Ronal Copper have leveling effects.

ACID COPPER: It is possible to obtain large degrees of surface leveling regardless of base metal condition. Addition agents have a pronounced effect. Phenol sulfonic acid has some leveling at 25 amps/ft² but deposit was rough at 50 amps/ft².

$CuSO_4$—28 oz/gal
H_2SO_4— 7 oz/gal Temp 95°

Glue has definite leveling effect at 25 amps/ft². Thiourea has brightening effect but no leveling. Thiourea 0.01 g/l + molasses 1 g/l does improve leveling even at 50 amps/ft². Thiourea 0.01 g/l + Dextrin 0.01 g/l has improved brightness and some leveling.

Cl (0.012 g/l) has no effect on leveling when used with Thiourea and dextrin.

Duponol SO—0.075 g/l has some beneficial effect in leveling.

Acid Cu containing Lea Ronal addition agent has considerable leveling with brightness improvement. Stability of brighteners in acid bath is highly important. Thiourea and related compounds are relatively unstable because of hydrolysis.

Samples were presented by Nobel to show the leveling that can be had with acid and cyanide copper.

Nominal Composition of Lea-Ronal Acid Copper is:

$CuSO_4$—28-32
H_2SO_4—7-8
Temp—95-110°
Violent air agitation
Lea Ronal Addition agent

The meeting was adjourned at 9:30 P.M.

H. J. WIESNER
Secretary-Treasurer

ST. LOUIS

Another Electroplating School

The December meeting was held Wednesday, December 14 at the York Hotel with 17 members present for the dinner and 25 for the meeting.

The business meeting was called to order by president **Hunleth** who asked each member to stand and introduce himself. The minutes of the previous meeting were read and approved. **Frank A. Runzi** was elected to membership. **Ward Kelly** reported the progress of the Electroplating School. As a result of a questionnaire circulated among the members, it was decided to go ahead with the school. The school will be held at Hadley Technical High School on Tuesday nights, classes to start the latter part of January.

The meeting was turned over to librarian **Dick Nyquist** who introduced the panel of experts consisting of **John Vogt** of Knapp Monarch Co., **Al Burnett** of Davies Supply & Mfg. Co. and **William C. George** of National Rejectors Inc. Many questions were asked and all were answered satisfactorily.

The meeting was adjourned with the branch officers wishing everyone a Merry Christmas and a Happy New Year.

WARD W. KELLY
Secretary-Treasurer

SEATTLE-PUGET SOUND

Boeing Plays Host

The Seattle-Puget Sound branch visited the Boeing Airplane Company plant at Seattle, in lieu of a business meeting for the month of December. The response for reservations was so great that the group had to be split and about 80 persons were shown the plant on December 7, and about 100 persons were present on December 14.

Colored movies of the test flights of the B-707 were shown and a tour of the plant was climaxed by seeing several nearly completed B-707's.

HELEN ARCHIBALD
Secretary

Hammond
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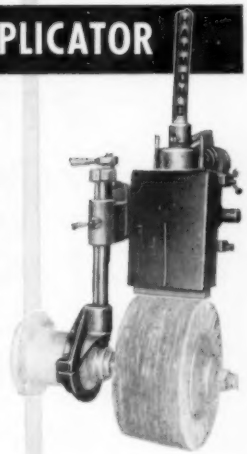

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BRANCH NEWS

SOUTHEASTERN

Lowenheim on Tin Alloy Plating

Our regular monthly meeting was held on Friday, December 9, 1955, at the Belmont Steak House, Atlanta, Ga. The meeting was called to order at 8:30 P.M., **Clyde Stovall** presiding, 20 members and guests present. Minutes of the preceding meeting were read and approved as read. **H. R. Stogner, Sr.,** gave a favorable report of the progress of the program committee relative to the Technical Session scheduled for February. An application for membership of **Mason C. Robbins,** Handy and Harmon Company, was voted accepted. **Charles Lewis** introduced our speaker for the evening who was **F. A. Lowenheim** of Metal and Thermit Corporation. Lowenheim rendered a most interesting and practical discussion on "Tin Alloy Plating," pointing out the need of the metal finishing industry to take advantage of the various attributes of alloy deposition, showing slide projections and samples. Adjourned 10:30 P.M.

ROBERT H. PROBERT
Assistant Secretary & Treasurer

SOUTHERN TIER

A Drive for New Members Gets Started

On November 15, 1955, the Southern Tier branch held its regular monthly meeting at the Hotel Langwell in Elmira, N. Y. The meeting was called to order by president **Rood** at 8:30 P.M. The minutes of the October meeting were read and accepted.

C. Bounds gave a report on the Christmas party progress thus far. **G. Zurenda** complimented the committee on the invitations and the arrangements.

Rood mentioned the importance of the need of new members. A committee was set up to work with **C. Harris** to this end. They are: **G. Zurenda, C. Cordier, V. Maxian** and **W. Rossiter.**

G. Zurenda brought up the idea of a visitor's night. The reason for this would be to introduce them to our Society and to show them our purpose and our goals and how they might benefit from them.

S. Stefanski then introduced our guest speaker, **John Asper** of DeVilbiss Corp. He showed a 45-minute picture which was entitled "Making the Most of Spray Painting Methods."

Question and answer period followed. Meeting adjourned at 10:45 P.M.

ROGER WHEELER
Secretary

NEW YORK BRANCH ANNUAL TECHNICAL, SESSION, DANCE & BANQUET

Sheraton-Astor Hotel, New York
Saturday, February 11, 1956

Technical Session at 2:30 PM will feature:

Dr. D. G. Foulke, Hanson Van Winkle Munning Co.
—**TOPIC:** "Leveling in Nickel Solutions"

Dr. Henry B. Linford, Columbia University.
—**TOPIC:** "A Shop Test for Determining Cleaning Time"

H. K. Hirschman, Department of Commerce
—**TOPIC:** "The Nickel Situation—Present and Future"

Ladies' Afternoon Tea and Card Party at 2:30 PM

Banquet at 7:30 PM

For tickets and reservations call or write New York Branch Secretary, Milton Nadel, 41-15 50th Avenue, Long Island, N. Y.; telephone—WOrth 4-6834

UNICHROME
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News about
COATINGS for METALS
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More reports of better chromium plating

Here are plants' experiences with deposits from Unichrome SRHS Solutions*

Companies using both SRHS Chromium Solutions and ordinary chromium have had an opportunity to compare results. Substantial differences have been reported.

BETTER COLOR NOTED

One plant of a well known company was using ordinary chromium over an ideal nickel surface. Another of this company's plants wasn't getting the best nickel deposit possible, but still its chromium plating had brightness superior to that of its sister plant. The second plant ascribed the difference to the SRHS Chromium being used in its tanks.

MINIMIZED REJECTS REPORTED

At one company, intricate parts were causing chromium plating difficulties. On occasion, rejects ran as high as 25%. Yet when the SRHS Chromium Solution was used, deposits covered beautifully and work was plated at a reject rate of no more than 0.4%.

UNUSUAL WEAR RESISTANCE FOUND

A large tool company chromium plated punches used in the manufacture of nuts. Various chromium solutions were tried. They reported that while ordinary chromium doubled the output from punches, deposits from SRHS Chromium tripled it.

All these reported "deposit-advantages" are in addition to the many thoroughly confirmed operating advantages of SRHS Chromium baths. These include plating with higher cathode efficiency, greater speed, a saving in power, and self regulation of important bath constituents.

Platers not using Unichrome SRHS Chromium will find it to their advantage to get the facts by writing United Chromium.

**Trade Mark*

A complete "package" of processes for chromium finishing

Unichrome Copper, Unichrome Bright Nickel and SRHS Chromium are so thoroughly suited to each other, they represent something unique in finishing. They're the first matched set developed exclusively by one company. Used together, they add up to more advantages than the sum of their individual benefits.

Better Operations and Results

Unichrome Pyrophosphate Copper contains no cyanide, saves disposal costs, and reduces or eliminates much buffing expense.

Unichrome Bright Nickel cuts downtime for purification, has unusual operating stability.

When both of these processes are used along with SRHS Chromium, benefits begin to multiply. The copper proves active for the nickel. In turn, the nickel shows unusual receptivity for the chromium. Passivity problems are eliminated. Downtime drops, rejects become rare.

Moreover, service responsibility rests with one source, assuring prompt technical help and a smooth running operation.

Bulletins supply details on each of the processes. Send for them.

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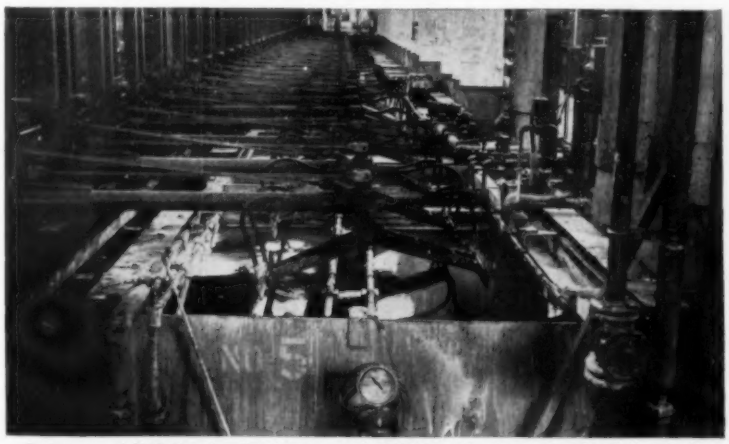
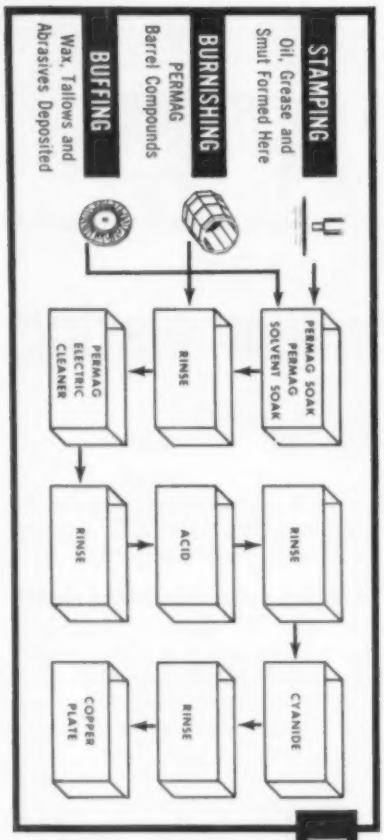


Performance of SRHS Chromium Solutions has resulted in their extensive use by major plating plants.



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SUSTAINING MEMBERSHIP LIST

As of December 31, 1955 (Figures in parenthesis indicate number of memberships held)

UNITED STATES

Accurate Electro-Plating, Inc.
Philadelphia, Pa. (Phil)

Acid Products Co., Inc.
Chicago, Ill. (Chic)

Acme Galvanizing, Inc.
Milwaukee, Wis. (Milw)

Acme Plating Company, The
Cleveland, Ohio (Clev)

Acme Steel Company
Chicago, Ill. (Chic)

Adolph Plating, Inc.
Chicago, Ill. (Chic)

Advance Plating Company, The
Cleveland, Ohio (Clev)

Advance Plating Co.
Subsidiary Aluminum, Ind., Inc.
Detroit, Mich. (Det)

Aetna Electroplating Company, Inc.
Philadelphia, Pa. (Phil)

Alert Supply Company
Los Angeles, Calif. (L.A.

Allen-Bradley Company
Milwaukee, Wis. (Milw)

Allied Research Products, Inc.
Baltimore, Md. (Bal-W)

Allis-Chalmers Mfg. Co.
Milwaukee, Wis. (Milw)

Alsop Engineering Corporation
Milldale, Conn. (Htfd)

Aluminum Company of America
New Kensington, Pa. (Pitt)

American Brass Co., The
Waterbury, Conn. (Wtby)

American Buff Company
Chicago, Ill. (Chic)

American Cabinet Hardware Corporation
Rockford, Ill. (Chic)

American Can Company
Maywood, Ill. (Chic)

American Chemical Paint Company
Ambler, Pa. (Phil)

American Electro Products, Inc.
Waterbury, Conn. (Wtby)

American Instrument Company
Silver Spring, Md. (Bal-W)

American Nickeloid Company
Peru, Ill. (Chic)

American Phenolic Corp.
Cicero, Ill. (Chic)

American Radiator & Standard Sanitary Corporation
Louisville, Ky. (Lvlle)

American Smelting & Refining Company
So. Plainfield, N. J. (Nwk)

American Wire Fabrics Corporation
Mt. Wolf, Pa. (Lanc)

American Zinc Institute (5)
New York, N. Y. (N.Y.)

Apex Plating Company
Chicago, Ill. (Chic)

Apollo Metal Works (2)
Chicago, Ill. (Chic)

Arkansas Metals Co.
Jonesboro, Ark. (Chic)

Ardco, Incorporated
Chicago, Ill. (Chic)

Arrow-Hart & Hegeman Electric Co.
Hartford, Conn. (Htfd)

Arrow Plating Company, Inc.
Chicago, Ill. (Chic)

Arted Chrome Plating Co.
Detroit, Mich. (Detr)

Arvin Industries, Inc.
Columbus, Ind. (Indpls)

Associated Plating Company
Los Angeles, Calif. (L.A.)

Atlas Plating Works
Cicero, Ill. (Chic)

Atlas Powder Co., Darco Sales
Wilmington, Del. (Balt.-W)

Auto City Plating Company
Detroit, Mich. (Detr)

Automotive Rubber Company
Detroit, Mich. (Detr)

Autoyre Company, Inc.
Oakville, Conn. (Wtby)

M. E. Baker Company
Cambridge, Mass. (Bost)

Barker-Webb Co., Inc.
Los Angeles, Calif. (L.A.)

Bart Laboratories Company, Inc.
Belleville, N. J. (Nwk)

Bart-Messing Corporation
Belleville, N. J. (Nwk)

Bastian-Blessing Company, The
Chicago, Ill. (Chic)

Beacon Supply Company
Chelsea, Mass. (Bost)

Belke Manufacturing Company
Chicago, Ill. (Chic)

Bell & Howell Company
Chicago, Ill. (Chic)

Bell Telephone Laboratories, Inc.
Murray Hill, N. J. (Nwk)

Bendix Prods. Div., Bendix Aviation Corp.
South Bend, Ind. (St. Jo)

Berteau-Lowell Plating Works
Chicago, Ill. (Chic)

Bethlehem Steel Company (2)
Bethlehem, Pa. (Al-Rd)

Big Ben Petroleum Products Co.
Chicago, Ill. (Chic)

Blakeslee, G. S. & Company
Cicero, Ill. (Chic)

Bruce Products Corporation
Howell, Mich. (Detr)

Buckeye Products Company, The
Cincinnati, Ohio (Cinc)

Buckingham Products Company
Detroit, Mich. (Detr)

Chandeysson Electric Company
St. Louis, Mo. (St. L.)

Chase Brass & Copper Company
Waterbury, Conn. (Wtby)

Chemical Corporation, The
Springfield, Mass. (Spfd)

Chicago Electro-Platers Institute
Chicago, Ill. (Chic)

Chicago Roller Skate Company
Chicago, Ill. (Chic)

Chicago Thrift-Etching Corp.
Chicago, Ill. (Chic)

Christie Plating Company
Groton, Conn. (N.H.)

Chromium Corporation of America
New York, N. Y. (NY)

Chromium Process Company, The
Shelton, Conn. (N.H.)

Chrysler Corporation (2)
Detroit, Mich. (Detr)

Clevite, Brush Development Company, Division of Clevite Corporation
Cleveland, Ohio (Clev)

Clinton Company, The
Chicago, Ill. (Chic)

Codman, F. L. & J. C., Company
Rockland, Mass. (Bost)
Continental Can Company, Inc.
Coffeyville, Kansas (Wich)
Corona Corporation
Jersey City, N. J. (Nwk)
Cowles Chemical Company, The
Cleveland, Ohio (Clev)
Crane Company
Chicago, Ill. (Chic)
Crane Equipment & Supply Co., Inc.
Waterbury, Conn. (Wtby)
Croname, Incorporated
Chicago, Ill. (Chic)
Crown City Plating Company
Pasadena, Calif. (L.A.)
Crown Cork & Seal Company
Baltimore, Md. (Bal-W)
Crown Rheostat & Supply Company
Chicago, Ill. (Chic)
Cutler-Hammer Company
Milwaukee, Wis. (Milw)

Davies Supply & Manufacturing Company
St. Louis, Mo. (St. L.)
Dexter Industries, Inc.
Grand Rapids, Mich. (Gr R)
Diamond Alkali Company
Cleveland, Ohio (Clev)
Diversey Corporation, The
Chicago, Ill. (Chic)
Dixie Electro Plating Company
Houston, Texas (Hstn)
Doehler-Jarvis Corporation
Grand Rapids, Mich. (Gr R)
Donald Sales & Mfg. Company
Milwaukee, Wis. (Milw)
R. R. Donnelley & Sons Company
Chicago, Ill. (Chic)
E. I. duPont de Nemours & Co., Inc.
Wilmington, Del. (Bal-W)
Duro-Chrome of Chicago, Inc.
Chicago, Ill. (Chic)

Eastern Electroplating Co.
Terryville, Conn. (Wtby)
Eastman Kodak Company (2)
Rochester, N. Y. (Roch)
Eaton Manufacturing Company
Cleveland, Ohio (Clev)
Ekco Products Company
Chicago, Ill. (Chic)
Electric Auto-Lite Company, The (2)
Sharonville, Ohio (Tldo)
Electro Glo Company
Chicago, Ill. (Chic)
Electrolux Corporation
Old Greenwich, Conn. (Bdpt)
Enthone, Inc.
New Haven, Conn. (N.H.)

Felt & Tarrant Manufacturing Company
Chicago, Ill. (Chic)
Finishing Publications, Inc.
Westwood, N. J. (Nwk)
Folding Carrier Corp.
Oklahoma City, Okla. (St.L.)
Ford Motor Company (5)
Dearborn, Mich. (Detr)
Formax Manufacturing Company
Detroit, Mich. (Detr)
Frigidaire Div., General Motors Corp.
Dayton, Ohio (Dayt)

P. B. Gast Company
Grand Rapids, Mich. (Gr R)
General American Transportation Corp.
Kanigen Division
Chicago, Ill. (Chic)
General Electric Company
Schenectady, N. Y. (Cap Dist)

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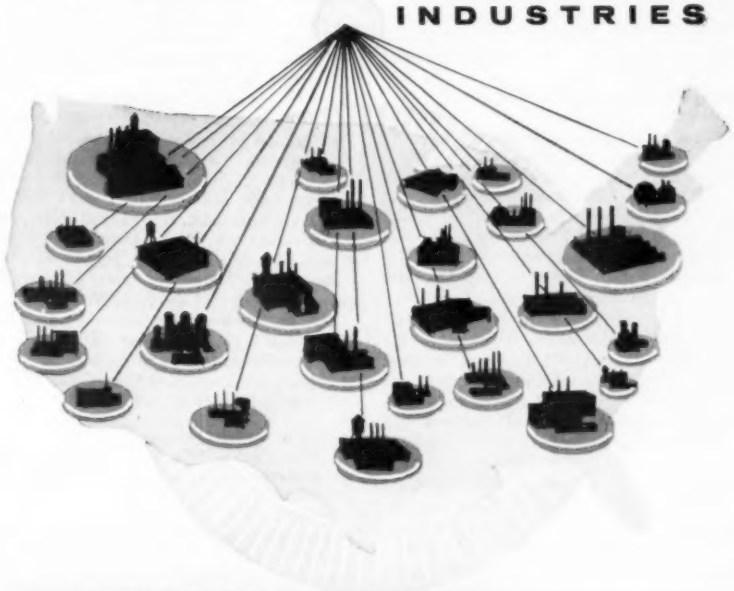

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SUSTAINING MEMBERSHIP LIST

(*Continued*)

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Detroit, Mich. (Detr)

General Plating Co.
Trenton, N. J. (Phil)

Gerity-Michigan Corporation
Adrian, Mich. (Detr)

Gorham Manufacturing Company
Providence, R. I. (Prov-A)

Graham, Crowley & Associates, Inc.
Jenkintown, Pa. (Phil)

Graham Plating Works
Chicago, Ill. (Chic)

L. F. Grammes & Sons, Inc.
Allentown, Pa. (Al-Rd)

Grand Rapids Plating Company Inc.
Grand Rapids, Mich. (Gr R)

Grand Steel & Mfg. Co.
Clawson, Mich. (Detr)

Great Lakes Industries, Inc.
Chicago, Ill. (Chic)

Gumm, Frederick, Chemical Company
Kearny, N. J. (Nwk)

C. Hager & Sons Hinge Mfg. Co.
St. Louis, Mo. (St. L.)

Hall-Mack Company
Los Angeles, Calif. (L.A.)

Hamilton Watch Company
Lancaster, Pa. (Lanc)

Hammond Machinery Builders, Inc.
Kalamazoo, Mich. (Gr R)

Hanson-Van Winkle-Munning Co. (3)
Matawan, N. J. (Nwk)

Harding Manufacturing Company
Detroit, Mich. (Detr)

Harlan Electric Co.
Detroit, Mich. (Detr)

Harper-Leader, Inc.
Waterbury, Conn. (Wtby)

Hardwood Line Manufacturing Company
Chicago, Ill. (Chic)

Harshaw Chemical Company, The (3)
Cleveland, Ohio (Clev)

Heil Process Equipment Corporation
Cleveland, Ohio (Clev)

Higgins Rack Coating & Mfg. Co.
Hazel Park, Mich. (Detr)

Houdaille Industries, Inc. (3)
Highland Park, Mich. (Detr)

Howard Plating Industries, Inc.
Royal Oak, Mich. (Detr)

Hudson Eng & Res American Mtrs. Corp.
Detroit, Mich. (Detr)

R. O. Hull & Company, Inc.
Rocky River, Ohio (Clev)

Hy-Grade Electroplating Company
Newark, N. J. (Nwk)

Industrial Filter & Pump Mfg. Co.
Chicago, Ill. (Chic)

Industrial Stamping & Mfg. Co., Division of Vinco Corp.
Detroit, Mich. (Detr)

International Business Machine Corp.
Endicott, N. Y. (S. Tier)

International Nickel Co., Inc. (5)
New York, N. Y. (N.Y.)

International Silver Company
Meriden, Conn. (Wtby)

James Plating Works, Inc.
Chicago, Ill. (Chic)

Jervis Corporation
Grandville, Mich. (Gr R)

Kaybar, Inc.
Birmingham, Mich. (Detr)

Kaynide Div., Kraft Chemical Co.
Chicago, Ill. (Chic)

Keeler Brass Company
Grand Rapids, Mich. (Gr R)

Kelite Products, Inc.
Chicago, Ill. (Chic)

Kelly Plating Company, The
Cleveland, Ohio (Clev)

Knape & Vogt Manufacturing Company
Grand Rapids, Mich. (Gr R)

Knapp-Monarch Company
St. Louis, Mo. (St. L.)

Knight Plating Company
Detroit, Mich. (Detr)

Kocour Company
Chicago, Ill. (Chic)

Kohler Company
Kohler, Wis. (Milw)

Lane Plating Works
Dallas, Texas (Da-Ft W)

Lasalco, Inc.
St. Louis, Mo. (St. L.)

R. Lavin and Sons, Inc.
Chicago, Ill. (Chic)

Lea Manufacturing Company, The
Waterbury, Conn. (Wtby)
Jamaica, L. I., N. Y. (N.Y.)
Long Island City, N. Y. (N.Y.)

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Philadelphia, Pa. (Phil)
Leyco Metal Finishers, Inc.
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Chas. F. L'Hommedieu & Sons Company
Chicago, Ill. (Chic)
Line Material Co.
South Milwaukee, Wis. (Milw)
Lorence Plating Co.
Cleveland, Ohio (Clev)
Lyon, Inc.
Detroit, Mich. (Detr)

Maas & Waldstein Company
Newark, N. J. (Nwk)
W. D. MacDermid Chemical Company
Bristol, Conn. (Wtby)
MacDermid, Incorporated
Waterbury, Conn. (Wtby)
Magnuson Products Corporation
Brooklyn, N. Y. (N.Y.)
R. C. Mahoney
Detroit, Mich. (Detr)
P. R. Mallory & Company, Inc.
Indianapolis, Ind. (Indpls)
Manderscheid Company, The
Chicago, Ill. (Chic)
Matchless Metal Polish Company, The
Chicago, Ill. (Chic)
Mattatuck Manufacturing Company
Waterbury, Conn. (Wtby)
Maurer Supply Company
St. Louis, Mo. (St. L.)
McGean Chemical Company, The
Cleveland, Ohio (Clev)
Meaker Company, The
Chicago, Ill. (Chic)

Mechanical Plating Company
Chicago, Ill. (Chic)
Mercil Plating Equipment Company
Chicago, Ill. (Chic)
B. Mercil & Sons Plating Company
Chicago, Ill. (Chic)
Metalcraft Corporation
Chicago, Ill. (Chic)
Metal Mouldings Corporation
Detroit, Mich. (Detr)
Metal Plating Corp.
Oak Park, Mich. (Detr)
Metal Processing Company
Chicago, Ill. (Chic)
Metal & Thermit Corp.
New York, N. Y. (N.Y.)
Metal & Thermit Corp. (2)
United Chromium Div.
New York, N. Y. (N.Y.)
Michigan Bumper Corporation
Grand Rapids, Mich. (Gr R)
Michigan Chrome & Chemical Company
Detroit, Mich (Detr)
Midwest Chrome Process Company
Detroit, Mich. (Detr)
J. C. Miller Co., Div. of H-V W-M Co.
Grand Rapids, Mich. (Gr R)
Millhorn Chemical & Supply Co.
Los Angeles, Calif. (L.A.)
Milwaukee Plating Company
Milwaukee, Wis. (Milw)
Minneapolis-Honeywell Regulator Co.
Minneapolis-Minn. (Tw Cty)
Mitchell-Bradford Chemical Co., The
Bridgeport, Conn. (Bdpt)
Modern Plating Company
Los Angeles, Calif. (L.A.)

Modern Plating Co.
Chicago, Ill. (Chic)
Modern Plating Corporation
Freeport, Ill. (Chic)
Moore Drop Forging Company
Springfield, Mass. (Spfd)
Motor Products Corporation
Detroit, Mich. (Detr)
Mutual Chemical Div. Allied Chem. and Dye Corp.
New York, N. Y. (N.Y.)

George L. Nankervis Company
Detroit, Mich. (Detr)
National Aniline Div., Allied Chemical & Dye Corporation
New York, N. Y. (N.Y.)
National Cash Register Company
Dayton, Ohio (Dayt)
National Lock Company
Rockford, Ill. (Rock)
National Rejectors, Inc.
St. Louis, Mo. (St. L.)
National Screw and Manufacturing Co.
Cleveland, Ohio (Clev)
New England Plating Company, Inc.
Worcester, Mass. (Htfd)
New Jersey Zinc Company of Penna. (3)
Palmerton, Pa. (Al-Rd)
George E. Nichols Plating
Los Angeles, Calif. (L.A.)
G. J. Nikolas & Company, Inc.
Bellwood, Ill. (Chic)
North American Avaition, Inc.
Los Angeles, Calif. (L.A.)
Northwest Chemical Company
Detroit, Mich. (Detr)

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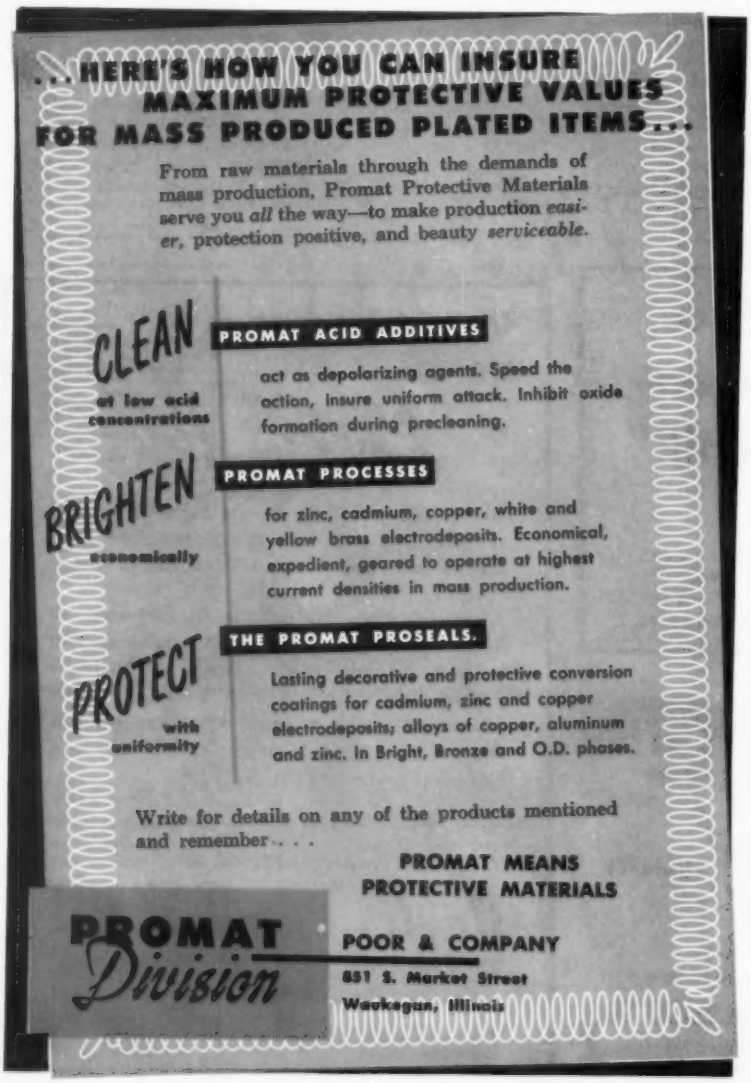
Northwestern Plating Works
Chicago, Ill. (Chic)
Nutmeg Chrome Corp.
W. Hartford, Conn. (Htfd)
Oakite Products, Inc.
New York, N. Y. (N.Y.)
Oakman Plating Company
Van Dyke, Mich. (Detr)
Oneida, Ltd.
Oneida, N. Y. (Syr)
John Oster Mfg. Co.
Milwaukee, Wis. (Milw)
F. D. Pace Company
Grand Rapids, Mich. (Gr R)
Packard Motor Car Company
Detroit, Mich. (Detr)
Pan Ormond Corp.
Ormond Beach, Fla. (SE)
Parker Pen Co.
Janesville, Wis. (Milw)
Pennsylvania Salt Mfg. Co.
Philadelphia, Pa. (Phil)
Perlick Brass Co.
Milwaukee, Wis. (Milw)
Perma Line Rubber Products Corp.
Chicago, Ill. (Chic)
Philadelphia Rust-Proof Company
Philadelphia, Pa. (Phil)
Philco Corporation
Philadelphia, Pa. (Phil)
Platers Supply Company
Cleveland, Ohio (Clev)
Platers Technical Service, Inc.
Chicago, Ill. (Chic)
Plating Institute of Michigan, The
Detroit, Mich. (Detr)
Plating Service Company
Chicago, Ill. (Chic)
Precision Castings Company of Michigan
Kalamazoo, Mich. (Gr R)
Preston Products Co.
Grand Rapids, Mich. (Gr R)
Price-Pfister Brass Manufacturing Co.
Los Angeles, Calif. (L.A.)
Products Finishing
Cincinnati, Ohio (Cinc)
Progress Mfg. Co., Inc.
Philadelphia, Pa. (Phil)
Promat Division, Poor & Company
Waukegan, Ill. (Chic)
Racine Plating Co., Inc.
Racine, Wis. (Milw)
Radio Corp. of America
Camden, N. J. (Phil)
Rawac Plating Co.
Springfield, Ohio (Dayt)
Reed Plating Company
Detroit, Mich. (Detr)
Reilly Plating Company
Melvindale, Mich. (Detr)
Reliable Plating Rack Co.
Schiller Park, Ill. (Chic)
R. W. Renton & Company
Cleveland, Ohio (Clev)
Republic Steel Corp.
Cleveland, Ohio (Clev)
Reynolds Company, The
Philadelphia, Pa. (Phil)
Richardson-Allen Corporation
College Point, L. I., N. Y. (N.Y.)
Roberts Rouge Company
Stratford, Conn. (Bdpt)
G. S. Robins & Company
St. Louis, Mo. (St. L.)
Roth Plating Corporation
South Bend, Ind. (St. Jo)
Roto-Finish Company
Kalamazoo, Mich. (Gr R)
Royal Plating & Polishing Company, Inc.
Newark, N. J. (Nwk)
Scientific Control Laboratories
Chicago, Ill. (Chic)
Scovill Manufacturing Company
Waterbury, Conn. (Wtby)
J. P. Seeburg Corporation
Chicago, Ill. (Chic)
E. E. Seeley Company, Inc.
Bridgeport, Conn. (Bdpt)
Sel-Rex Precious Metals, Inc.
Belleville, N. J. (Nwk)
Seymour Mfg. Company
Seymour, Conn. (Wtby)
J. J. Siefen Company
Detroit, Mich. (Detr)
Smoothex, Inc.
Cleveland, Ohio (Clev)
Solventol Chemical Products, Inc.
Detroit, Mich. (Detr)
Sommers Brothers Mfg. Company
St. Louis, Mo. (St. L.)
Sparkler Manufacturing Company
Mundelein, Ill. (Chic)
C. D. Sparling Co.
Detroit, Mich. (Detr)
Spence Electro Plating Company
Los Angeles, Calif. (L.A.)
Standard Nickel-Chromium Plating Co.
Los Angeles, Calif. (L.A.)
Standard Plating Rack Company
Chicago, Ill. (Chic)
Standard Plating Works, Inc.
Goshen, Ind. (St. Jo)
Standard Steel Spring Division
Rockwell Spring and Axle Co. (3)
Coraopolis, Pa. (Pitt)
Stanley Works, The
New Britain, Conn. (Htfd)
Steel Heddle Mfg. Co.
Philadelphia, Pa. (Phil)
Stevens, Frederic B., Inc. (2)
Detroit, Mich. (Dtr)
Stromberg-Carlson Co., Div. of Gen'l Dynamics Corp.
Rochester, N. Y. (Roch)
Studebaker Corporation, The
South Bend, Ind. (St. Jo)
George A. Stutz Manufacturing Company
Chicago, Ill. (Chic)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FINISHING METHOD	FINISH TIME	COST PER DISC	QUALITY	DISCS PER YR.	COST PER YR.	PROD. INCR.	COST SAVINGS
FILE AND WIRE BRUSH	18 HRS.	$124.92	VARIED	231	$28,870	—	—
SUPERSHEEN DBF-200 BARREL	4 HRS.	$ 5.68	UNIFORMLY GOOD	1040	$ 5,907	450%	$124,000

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This Almco SUPERSHEEN fixture-type barrel is paying for itself every week.

Compressor rotor discs for jet aircraft must be finished to rigid Air Force specifications at the Le Roy Machine Co., a New York manufacturer of automotive and aircraft parts. Above you see the final inspection of these parts, just barrel finished. Inspected under powerful magnifying glass, critical break-edges of the discs are right down to A. F. specs.

"Supersheen methods were largely responsible for achieving and maintaining the high quality required for aircraft manufacture," reports R. O. Braaten, Le Roy project engineer. Prior to the installation, the rotor discs were deburred by file and wire brush.

Then an Almco finishing engineer recommended that some sample discs be barrel finished . . .

In Almco's Newark laboratory, it was found that deburring these parts required tough, Supersheen bonded abrasive chips, ⅛ in. steel diagonals and abrasive compound to meet strict A. F. requirements and yet get the fastest possible cutting, grinding and polishing action.

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Remember, the SUPERSHEEN METHOD is a complete barrel finishing service that begins with an Almco finishing engineer analyzing your specific problem. Then free tests are conducted on your sample parts at the Almco laboratory nearest your plant. The correct media, compounds, barrel rpm, water level and time cycle are determined in order to precision finish those parts; often a complete test can be run in a matter of hours.

Helping you select the correct size barrel or barrels for your operation is the next step. And whenever you need expert help in finishing problems, ALMCO is at your service. For further information and literature, write, Almco, 104 Marshall St., Albert Lea, Minn.

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(Continued)

Summit Finishing Co. Inc.
Thomaston, Conn. (Wtby)
Sunbeam Corporation
Chicago, Ill. (Chic)
Sundmark Supply Co.
Los Angeles, Calif. (L.A.)
Superior Steel Corp.
Detroit, Mich. (Detr)
Surface Alloys, Inc.
Huntington Park, Calif. (L.A.)
Sylvania Electric Products, Inc., The
Flushing, N. Y. (N.Y.)
Talon, Inc.
Meadville, Pa. (Clev)
Ther Electric & Machine Works
Chicago, Ill. (Chic)
Thomas Strip Div., Pittsburgh Steel Co.
Warren, Ohio (Clev)
Time Chemical, Inc.
Chicago, Ill. (Chic)
Turco Products, Inc.
Los Angeles, Calif. (L.A.)

Udylite Corporation, The
Detroit, Mich. (Detr)
United-Carr Fastener Corporation
Cambridge, Mass. (Bost)
United Manufacturing Company
Chicago, Ill. (Chic)
United Platers, Inc.
Detroit, Mich. (Detr)
United States Spring & Bumper Company
Los Angeles, Calif. (L.A.)

Van Der Horst Corporation of America
Olean, N. Y. (Bflo)
Victor Casket Hardware Co.
Galesburg, Ill. (Miss V)
Virtue Bros Mfg. Company
Los Angeles, Calif. (L.A.)

Wagner Brothers, Incorporated
Detroit, Mich. (Detr)
Walton & Lonsbury
Attleboro, Mass. (Prov-A)
Waterbury Companies
Waterbury, Conn. (Wtby)
Waterbury Plating Company
Waterbury, Conn. (Wtby)
Weirton Steel Company
Weirton, W. Va. (Pitt)
Western Electric Company, Inc.
Chicago, Ill. (Chic)
Western Rust Proof Company
Chicago, Ill. (Chic)
Westinghouse Electric Corp.
E. Pittsburgh, Pa. (Pitt)
Whitfield Chemicals
Detroit, Mich. (Detr)
Whyco Chromium Co., Inc.
Thomaston, Conn. (Wtby)
Edwin L. Wiegand Co.
Pittsburgh, Pa. (Pitt)
S. K. Williams Company
Milwaukee, Wis. (Milw)
Winchester Repeating Arms Company
New Haven, Conn. (N.H.)
Wollensak Optical Company
Rochester, N. Y. (Roch)
Wyandotte Chemicals Corp.
Wyandotte, Mich. (Detr)

Yankee Metal Products Corporation
Norwalk, Conn. (Bdpt)

CANADA

Alloycraft, Ltd.
Westmount, Montreal (Mont)
Armalite Company, Ltd.
Toronto, Ont. (Tor)
Behr-Manning (Canada), Ltd.
Brantford, Ont. (Ham)
Bendix-Eclipse of Canada, Ltd.
Windsor, Ont. (W Ont)
Bomac Electrotype Co., Ltd.
Toronto, Ont. (Tor)
Canada Cycle & Motor Co., Ltd.
Weston, Ont. (Tor)
Canadian Motor Lamp Company, Ltd.
Windsor, Ont. (W Ont)
Dominion Foundries & Steel, Ltd.
Hamilton, Ont. (Ham)
General Motors of Canada, Ltd.
Oshawa, Ontario (W Ont)
Hanson Van Winkle Co. of Canada, Ltd.
Toronto, Ont. (Tor)
Houdaille-Hershey of Canada, Ltd.
Oshawa, Ont. (Tor)
International Nickel Company of Canada
Toronto, Ont. (Tor)
Lea Manufacturing Company of Canada
Toronto, Ont. (Tor)
Ontario Steel Products Co., Ltd.
Chatham, Ont. (W Ont)
Steel Company of Canada, Ltd., The
Hamilton, Ont. (Ham)
Union Screen Plate Co. of Canada, Ltd.
Montreal, Quebec (Mont)
United Chromium, Ltd.
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WANTED—Sales Service Engineer to call on Metal Finishing trade in Providence area. To sell and service industrial metal cleaners, Plating supplies and equipment manufactured or distributed by a New England concern. Reply to Box F3, PLATING, 445 Broad St., Newark 2, N. J.

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WANTED—Sales and service man with metal finishing experience, preferably with chemical background. To work Detroit and surrounding area. Reply to Box F5, PLATING, 445 Broad St., Newark 2, N. J.

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INDEX TO ADVERTISERS

This index is published as a service to our readers. We regret we cannot assure avoidance of inadvertent errors and omissions despite the many precautions exercised.

Acme Mfg. Co. 209
Alchemize Corp. 279
Allied Industries Co. 282
Allied Research Products, Inc. 202
Almco Div., Queen Stove Works 285
Alsop Engineering Corp. 180
American Brass Co. 210
American Buff Co. 255
American Instrument Co. 192
American Platinum Works 193
Angler Chemical Co. 283
Anode Products Co. 282
Apothecaries Hall Co. 207
Atlantic Compound Co. 259

M. E. Baker Co. 206
Baker & Adamson Div. Allied Chemical & Dye Corp. 175
Bart-Messing Corp. 168, 177
Beam-Knodel Co. 283
Belke Mfg. Co. 203
Better Finishes & Coatings, Inc. 176

Casalbi Co. 211
Chemical Corp. 196, 278
Chemsteel Construction Co. 278
Cleveland Process Co. 258
Conversion Chemical Corp. 184
Cowles Chemical Co. 183, 204, 213

Davies Supply & Mfg. Co. 266
Diesel Chemical Co. 264
Dixon & Rippel, Inc. 289
Duggan Masking Devices 264

Elkhart Controls Co. 269
Enthone Inc. 167

Federated Metals Div. American Smelting & Refining Co. 182
Fulton Asphalt Co. 268
Frederick Gumm Chemical Co. Inc. Inside Front Cover

Hammond Machinery Builders, Inc. 191, 197, 277
Hanson-Van Winkle-Munning Co. Back Cover, 263
Harrison & Co. 275
Harshaw Chemical Co. 170
R. O. Hull & Co. 216, 217

Illinois Water Treatment Co. 267
Infilco, Inc. 190
Iritox Chemical Co. 276

Jelco Finishing Equipment Corp. 278
Kocour Co. 256

Joseph B. Kushner 289

Lasalco, Inc. 179
Lea Manufacturing Co. 199
Lea-Ronal, Inc. 200
Charles F. L'Hommedieu & Sons 181

MacDermid, Inc. Inside Back Cover
Magnuson Products Corp. 280
Meaker Co. 281
Merchants Chemical Co., Inc. 212
Michigan Buff Co. 282
Michigan Chrome & Chemical Co. 173
Minnesota Mining & Mfg. Co. 249, 262
Mutual Chemical Division Allied Chemical & Dye Corp. 257

Oakite Products, Inc. 187

Phelps-Dodge Refining Corp. 250
Photovolt Corp. 276
Platers Research Corp. 270
Powers Regulator Co. 269
Promat Division Poor & Co. 284

Richardson-Allen Corp. 195

Schaffner Mfg. Co. 218
Schori Process Div. Ferro-Co. Corp. 208
E. E. Seeley Co., Inc. 266
Sellers Engineering Co. 185
Sel-Rex Precious Metals, Inc. 168
Sethco Mfg. Co. 265
Seymour Mfg. Co. 198
Steadfast Industries, Inc. 206
Frederic B. Stevens, Inc. 235, 236, 237, 238
Storts Welding Co., Inc. 186
Sulphur Products Co., Inc. 275
Swift Industrial Chemical Co. 277

True Brite Chemical Products Co. 174, 265

Udylite Corp. 214, 215
Unit Process Assemblies, Inc. 283
United Chromium, Inc. 279, 290
Univertical Foundry & Machine Co. 268

Wagner Brothers, Inc. 271, 272, 273, 274
Wallace & Tiernan, Inc. 189
Wyandotte Chemicals Corp. 205

Zialite Corp. 282

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February 26-29—American Institute of Chemical Engineers, Los Angeles, Calif.

February 20-23—American Institute of Electrical Engineers (AIEE), Hotel Statler, N. Y.

February 27-March 2—ASTM Committee Week, Hotel Statler, Buffalo, N. Y.

March 12-16—NACE Annual Conference and Exhibition, Hotel Statler, N. Y.

March 14-16—ASME Aviation Division Conference, Los Angeles, Calif.

March 19-23—ASTE Industrial Exposition & 24th Annual Meeting, International Amphitheatre, Chicago, Ill.

March 18-20—Steel Founders' Society of America, Annual Meeting, Chicago.

March 26-27—ASME Instruments and Regulators Division Conference, Princeton, N. J.

AES

February 10-11—Annual Meeting, Educational Session and Banquet, Southeastern Branch, AES, Biltmore Hotel, Dayton, Ohio.

March 9—AES Research Committee Meeting, Hotel Biltmore, Dayton, Ohio.

March 10—Third Annual Tri-State Regional Meeting, AES, Hotel Statler, Buffalo, N. Y.

April 7—New England Regional Meeting, AES, Hotel Statler, Hartford, Conn.

April 14—Second Annual Empire State Regional Meeting, AES, Hotel Statler, Buffalo, N. Y.

April 14—Annual Educational Session and Banquet, Rockford Branch, AES, Faust Hotel.

May 5—Annual Regional Meeting, Toronto Branch, AES, Sheraton-Brock Hotel, Niagara Falls, Ontario, Canada.

June 17-21,—43rd Annual Convention of the AES, Hotel Statler, Washington, D. C.

June 17-20, 1957—44th Annual Convention of the AES, Sheridan-Mt. Royal Hotel, Montreal, Canada.

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